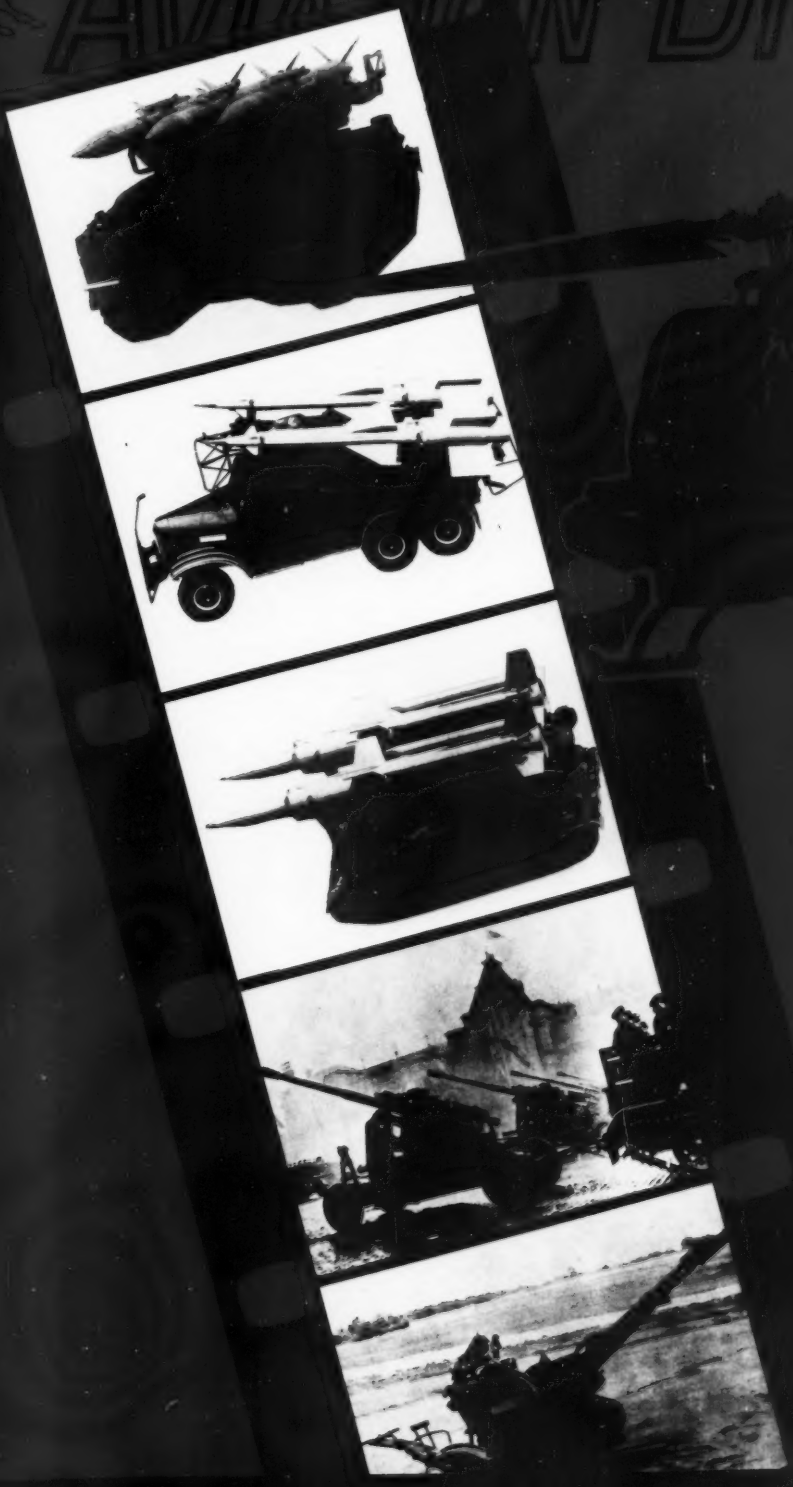
UNITED STATES ARMY

SEPTEMBER 1974

AVIATION DIGEST



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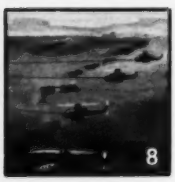

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DEPUTY COMMANDING GENERAL
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BG James M. Leslie

EDITOR, U. S. ARMY AVIATION DIGEST
Richard K. Tierney

ABOUT THE COVER

This issue accents the threat to U. S. airmobile operations. On the cover the film depicts enemy air defense weapons and the helicopter is an Army AH-1 HueyCobra, which represents airmobile tactics. The cover was prepared by M. Derough

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THE THREAT TO UNITED STATES AIRMOBILE OPERATIONS

Randolph Britt, DAC

The author is currently assigned as an Intelligence Research Specialist with the U. S. Army Foreign Science and Technology Center, Charlottesville, VA. Mr. Britt is a former U. S. Naval aviator

THE PRINCIPAL THREAT to airmobile operations of the U. S. Army is to be found in the Warsaw Pact forces, particularly those of the Soviet Union. This article focuses attention on those Soviet air defense systems employed in defense of Warsaw Pact field forces which would likely be encountered by opposing airmobile forces. It should be borne in mind, also, that many of these weapons have been and will be found in the hands of other combatants in other areas such as the Middle East and Southeast Asia.

While the USSR has not adopted airmobile divisions as employed by the United States, an awareness exists of current U. S. airmobility concepts and the ensuing threat implications for Warsaw Pact air defense units. Concern in this area is pointed up by a recent article in

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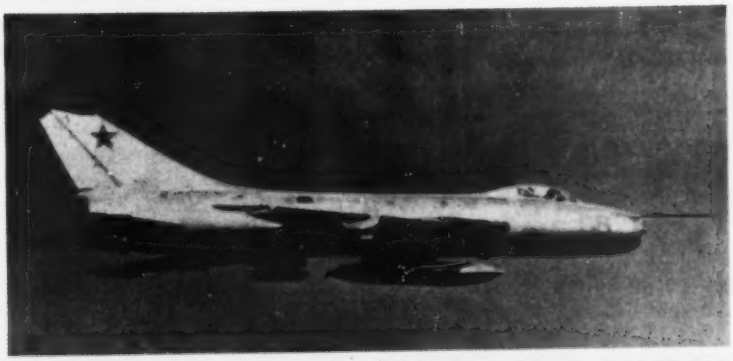

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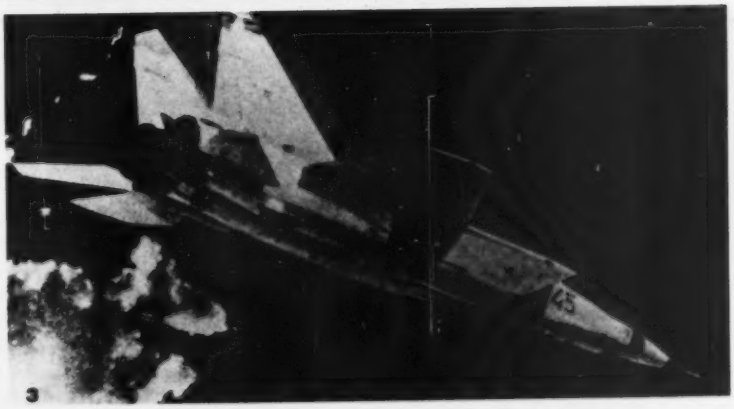

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1: Mig-21 Fishbed
2: SU-7 Fitter
3: Mig-25 Foxbat
4: Mig-23 Flogger

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VANGUARD OF FREEDOM
BICENTENNIAL 1775-1975
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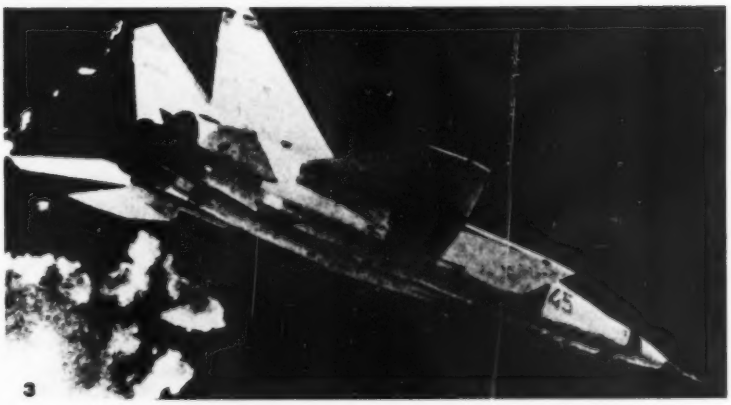

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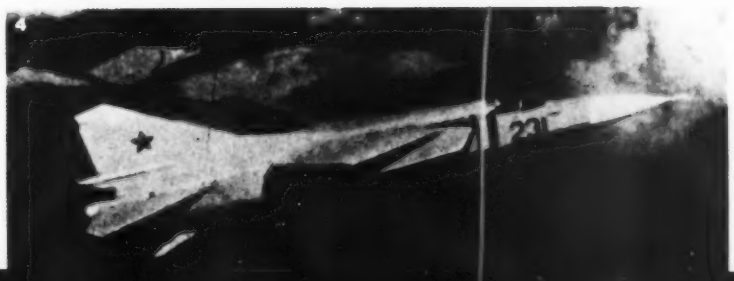
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Military Intelligence AND Enemy Air Defense

Brigadier General Harry H. Hiestand
Commander, U. S. Army Intelligence Center and School
Fort Huachuca, AZ

...We can get the intelligence information—the problem is dissemination in time for mission planning to counter enemy air defense systems.... The author discusses the new tactical imagery interpretation facilities and processing laboratories as important solution steps

TO ENSURE THAT a viable program is adopted to counter enemy air defense systems, the coordinated efforts of the U. S. Army Training and Doctrine Command (TRADOC) schools, the U. S. Army Aviation Systems Command (AVSCOM) and the U. S. Air Force (USAF) are required. The intelligence community has a number of on-going programs which emphasize the importance of collecting, processing and disseminating intelligence information in a prompt manner. Additional training on this overall subject may be required both at the Aviation Center at Ft. Rucker, AL, and at the Intelligence School at Ft. Huachuca, AZ.

For the past 3 years training on the enemy air defense threat has been conducted for personnel attending the Aviation Combat Surveillance Qualification Course at the U. S. Army Intelligence Center and School. These personnel, as well as the airborne sensor specialists, also receive training on the radar homing and warning receivers. Subject matter is constantly being updated as information becomes available or new equipment is introduced.

The massive introduction of the helicopter added a new dimension to the battlefield by giving the ground force commander an organic capability for vertical envelopment of enemy forces. This was demonstrated successfully in the Republic of Vietnam, though our earlier modes of air operations proved inadequate when more sophisticated antiaircraft weapons were introduced by the communist forces. Changes from heretofore successful tactics were again required when the unprecedented air defense array supplied by the Soviet Union to the Arab forces confronted the previously unchallenged Israeli Air Force with extremely serious problems. In a possible future conflict, we can expect to encounter more advanced antiaircraft systems in large numbers, our potential enemies having recognized our capabilities and developed a formidable array of air defense weapons as countermeasures [see "When Helicopters Are Airborne," page 8].

My approach to the problem of providing Army aviation with intelligence required to counter enemy air defense systems is to determine what information is needed,

how to acquire it and how to disseminate it. Probably the most important element of information needed is the precise location, quantity and details of enemy air defense weapons systems. To acquire such information the Army has several general categories of information collectors; these are ground and aerial visual observation, surveillance systems, radiation emitter location systems, prisoners of war and to, perhaps a lesser degree, intelligence agents.

Technical intelligence sources can provide the answers to essential elements of information concerning the enemy's surface-to-air weapons. However, despite our capability to determine what an enemy has and where he has it, the information does no good until it is adequately processed, correlated and disseminated. In short, information collected is of little value unless a system is provided to make that information available on an immediate basis to those who need it.

The Army aviator and the aviation operations officer need this information when they try to determine how best to reach a target area in enemy airspace. Where do they get the detailed data? How can the aviation people use this information in their planning? Do they have the requisite training needed? Detailed mission planning does not take place where the intelligence is, and there does not seem to be an adequate means to provide timely intelligence for aviation mission planning. Perhaps introduction of the integrated battlefield control system will solve the problem of early dissemination of information.

The major problem, as I see it, is to correlate the abundance of information collected and then to disseminate this information to the using aviation elements in a timely and efficient manner. The problem of coordinating the collected information with penetration aids and suppression systems is no small task and must be a joint effort among ground forces, Army aviation elements, USAF and all intelligence agencies. Both intelligence and aviation units must be forced to habitually transmit this information to higher, lower and adjacent units by the fastest means available.

Currently, we do not have a means to process air defense data other than the normal intelligence cycle and collection plan. Our interface with the Air Force has been oriented primarily toward obtaining air combat power on an enemy target or specific information on enemy activities well forward of the forward edge of the battle area (FEBA). Because until recently we have not had need for Air Force intelligence concerning enemy antiaircraft distributions, enemy early warning radars and ground control interception and target acquisition radars, we have not established a mechanism or channel for obtaining this information.

Flight crews on aerial reconnaissance/surveillance or logistical support missions are an excellent source of information concerning enemy air defense when they are motivated to report all that they see. Aids available to them include high-power radar jammers, decoy aircraft or remotely piloted vehicles, chaff dispensers, fuze jammers, radar homing and warning receivers, and infrared (IR) suppressor kits and/or detection systems.

The OV-1D Mohawk surveillance system is currently the principal Army airborne collection asset. This aircraft with the improved side-looking airborne radar (SLAR), IR and photographic systems has the capability to detect, locate and to some degree identify enemy activity or equipment. While the SLAR system can be effectively employed in a standoff mode, out of reach of the enemy air defense threat, effective employment of IR and photographic systems requires penetration of enemy airspace. The Mohawk's ability to penetrate and survive is subject to the same considerations and limitations of other aircraft—the location, makeup and density of the enemy air defense systems, coupled with our ability to neutralize or destroy them.

A further limitation of the Mohawk surveillance system, timeliness of information, is being overcome by development of two data transmission systems: the Army In-Flight Data Transmission System (AIDATS) and the Interim Data Transmission System for Europe. The AIDATS will provide near realtime transmission for SLAR and IR imagery, through an airborne relay if required, to a surface recording terminal at the user locations. The data transmission system for Europe recently proposed by the Army Intelligence Center and School is a modification and improvement of the now outdated SLAR data transmission system. The data transmission system for Europe will provide an interim capability for transmission of SLAR imagery pending full development of the AIDATS.

While correlating the mass of information acquired, consideration must be given to terrain in

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Air Defense

What the Army aviator always wanted to know about ADA — but was afraid to ask

Colonel James A. Kilgore

Director, Tactics Department
U. S. Army Air Defense School, Ft. Bliss, TX

The author tells of Air Defense equipment, such as Nike Hercules at left, capabilities and rules of engagement for the benefit of flight crewmen. Aviation personnel may gain insight into tactical airspace utilization, restrictions and control circumstances and there are thoughts to consider during nap-of-the-earth (NOE) operations

THE AIRSPACE ABOVE the combat zone is used by all services and by all combat branches within the Army. It often appears that each feels it has exclusive rights to the use of the air in the accomplishment of its mission. It would be difficult to refute that each, at a given time, must have use of a portion of the airspace and a problem is encountered anytime two or more try to use the same space at the same time.

Airspace became a problem during World War I when the U. S. Air Service provided close air support for U. S. forces in the Meuse-Argonne battle. Between World Wars I and II new concepts for integration of air into the land battle scheme were developed. During World War II there was a growing awareness of a need for the control of aviation. Initially, air support was dedicated to individual units for direct support; however, this system proved unsatisfactory during the battle of Kasserine Pass in February 1943. This was primarily because it failed to provide arrangements necessary to mass theater-wide air assets required to counter major concentrated enemy threats. But a "quick fix" radically changed our control doctrine and this revision and application brought immediate and decisive results. Air superiority was wrested from the enemy permitting allied bombers some degree of freedom and our fighter sweeps to mount up to 2,000 sorties a day.

Our forces have always sought and managed to obtain air superiority and it has been more than 20 years since an American army has been faced with a sophisticated air attack.

Now, the Army aviator reading this article may start to wonder, "Then what's the point? Why should I need to know about air defense?" He may remember the helicopter in Korea and most assuredly remembers the Army aviator's contributions in the Republic of Vietnam. It's well known that the helicopter performed yeoman service in Vietnam. The Army aviator proved his courage and flying skill many times over. The helicopter pilot established himself as an indispensable member of a combined arms team which ranged from the foot soldier on the ground to the "men in blue."

But the skies over South Vietnam were "friendly skies." In that war we again enjoyed the luxury of complete air superiority. It may well have been the last such war. A comparison of U. S. Air Force assets against those of other countries with which we might engage in future conflict portends that total U. S. air superiority is probably a thing of the past.

So let's turn the Vietnam experience around to conform to what we might logically expect in some future war. Those jets over our area of operations may bear other markings. Instead of the friendly F-4 we could see the not-so-friendly MIG. It's there in numbers and it's flown by a fellow who harbors an intense hate for helicopters, especially those with U. S. markings. A natural bully, he attacks our formations with abandon. Our derring-do notwithstanding, we're not up to a dogfight with him. Do we have a problem? Indeed we do!

Enter the air defense artilleryman. You might remember, he was the guy you saw in Vietnam who wore the crossed cannons with the missile in the middle, who performed a variety of tasks—advised the ARVN (Army, Republic of Vietnam) soldier on infantry tactics, flew airplanes and helicopters, furnished convoy protection and perimeter defense with his "Duster"—almost everything but the one thing he's primarily trained to do: shoot down enemy aircraft. Yes, the air defense artilleryman soldiered well in Vietnam. He gained combat experience and he did a lot to promote short tour equity among the branches; but his primary skill was not needed—all the aircraft overhead were ours.

Well, what can the Air Defense Artillery (ADA) guy do in this new environment where the jets overhead present more than just a backwash problem to the Army aviator? First, he has some potent weapons which tend to even the odds a bit, particularly when our Air Force jets are in short supply.

The Nike Hercules is a long range missile system that can engage high speed aircraft with either a conventional or nuclear warhead out to about 140 kilometers in range and up to about 100,000 feet in altitude. It achieves its greatest lethality at the higher altitudes and is most often employed far above the normal operating level of Army aircraft. Nike Hercules units usually are assigned to theater air defense organizations and positioned in the rear area.

The cornerstone of air defense in support of the Army in the field is the Hawk missile system. Its

combat proven effectiveness against the high speed, low altitude threat, along with its capability to rapidly displace by echelon while providing continuous protection for the ground forces, makes it well suited for employment within the corps and division areas. Current air defense doctrine places a Hawk battalion with each committed division.

Highly mobile Chaparral missile and Vulcan gun systems provide short range or close-in defense of the corps and division commanders' priority assets against low altitude air attack. These systems furnish backup protection for units and installations against enemy aircraft which may get through the longer range defense provided by the radar directed Hercules and Hawk systems.

Redeye teams assigned to maneuver and cannon artillery units provide an additional means of forward area air defense against aircraft attacking at low altitudes. Redeye gives battalion and company sized units their own dedicated air defense weapon.

In employing these weapons systems the air defense artilleryman adheres to the basic principles of mass, mix, mobility and integration. In short, this means that he uses a variety of weapons in sufficient numbers to protect priority assets well; he ties them together in a coordinated defense; and he moves these weapons as necessary to support the maneuver plan and to

We could see the not too friendly Mig 21s above, or the SU-7, right. Both are very capable in ground attack missions

counter attempts at air defense suppression.

So the ADA has some potent weapons and knows how to use them. But how does this help the Army aviator do his job? One of the more important lessons learned from the most recent Mid-East war is that ground based air defense systems, when employed in accordance with sound doctrine, can —by themselves—achieve dominance over local airspace, even in the face of a superior enemy air force. Army air defense charges the air attacker a high price of admission (a price he may not be willing to pay) but its value cannot be measured in terms of enemy aircraft kills alone. Its mere presence often will force an aircraft to resort to ineffective attack techniques or to completely abort its mission. Low altitude air defense systems tend to force the attacker to higher altitudes, leaving you—the Army aviator—the airspace you need to do your job.

Given the fact that Army aviation will find it extremely difficult to work *without* air defense artillery when confronted with a superior enemy air force, it follows that the aviator must know how to work *with* the air defense artilleryman to accomplish his mission with minimum risk from ADA fires. One cannot just turn ADA "off" and aviation "on" at will; they must function together in the same volume of airspace. Unfortunately, those ADA systems mentioned earlier can shoot down ours as well as theirs if proper coordination is

The Vulcan guns furnish backup for ground units against aircraft that may get by the Hercules and Hawk

not effected. The key to success is a common understanding of both aviation and ADA operations among all those involved.

For ADA the primary problem is, of course, aircraft identification. A policy of "shoot 'em down and sort 'em out on the ground" is obviously not acceptable. Air defense rules and procedures are established to permit rapid and accurate identification of friendly and enemy aircraft; but, if they are to be effective and accidents are to be avoided, the cooperation of the Army aviator is required.

It may seem to you that this air defense fella speaks in a strange tongue when talking weapons control and coordination; he may babble such phrases as *weapons free, weapons tight* and *weapons hold* (see box). Actually, it's not all that complicated. Let's take a quick look at some of the control measures used for the various ADA weapons systems.

We'll bypass Nike Hercules since, as mentioned earlier, it is usually deployed in rear areas and normally engages aircraft above the operating level of Army aviation. With Hawk, it's a different story. Since it is deployed in the forward area and can engage aircraft from treetop level up to about 45,000 feet, the "Homing All the Way Killer" is in our ballpark.

The ADA lieutenant who is controlling the fires of the Hawk battery or platoon seldom sees the aircraft he is engaging. He makes his identification based on what he sees on a radar scope. More often than not during combat he will be operating under decentralized control, which means that he can engage aircraft meeting hostile criteria established by higher air defense authority (the theater Air Force commander in most cases).

Weapons Control Status

Weapons free: Fire at any aircraft not identified as friendly. Aircraft of unknown or doubtful identification may be engaged.

Weapons tight: Fire only at aircraft positively identified as hostile in accordance with hostile criteria. (Criteria is normally visual identification as enemy by configuration or markings or any aircraft attacking friendly elements.)

Weapons hold: Do not fire (the right of self-defense is never denied). This status is normally time, area or unit limited and may be further limited as to class of aircraft protected (e.g., "Redeye Weapons Hold," 1600-1630, Area PB, Helicopters).

He will normally be given a combination of factors to be considered before declaring an aircraft hostile. Such items as speed, heading, location, altitude and IFF (identification, friend or foe) may be used. The latter almost always will be included, therefore, it is very important for his own safety that the Army aviator know IFF procedures and abide by them.

The Hawk system is used primarily to engage high speed, fixed wing aircraft—not helicopters. Army aircraft and Hawk can work well together as long as the pilot knows the rules under which Hawk is operating, avoids its hostile criteria and religiously adheres to prescribed IFF modes and codes.

With short range weapons (Chaparral, Vulcan and Redeye) identification procedures are simpler in theory, yet more difficult in practice. Here the ultimate decision of whether to engage an aircraft normally rests with the enlisted man in charge of the individual weapon and he relies primarily on visual identification. He may be provided early warning and tentative identification from outside sources, such as the Hawk radars and the forward area alerting radars of the Chaparral/Vulcan battalion, but his "end game" identification is by eyeball.

As with Hawk, rules and procedures for engagement of aircraft will be established by higher air defense authority. The weapons control status indicates the degree of fire control imposed on the air defense weapon.

"Aha," you say, "keep 'em all on *weapons hold* or *weapons tight*; that's safest for me." Not necessarily, my friend. Remember, the enemy has air superiority. Those MIGs are seeking you out on the ground and in the air. Also, remember the enemy has a few helicopters of his own which may be bringing in troops to do a job on your helipad. And remember your old ADA partner. *Weapons free* is highly favorable for air defense effectiveness. The Chaparral, Vulcan or Redeye gunner has just a few seconds from the time he first

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Hawk missile – cornerstone of air defense for the soldiers in the field against the high speed, low altitude threat

When Helicopters Are Airborne

TACTICS outlook

This is a reprinted translation of an article that appeared in the Russian periodical MILITARY HERALD. It reflects a Russian general officer's evaluation of the U. S. Army's NOE helicopter airmobile threat. It also covers thoughts concerning air defense tactics to offset this threat

Reprinted from MILITARY HERALD, No. 11, 1973

V. Gatsolayev

Lieutenant General of Artillery

UNTIL RECENTLY, helicopters played a secondary role on the battlefield. They were employed for providing various types of support for the Ground Forces. However the situation at the present time, as borne out by the foreign press, is quite different. The need for effective air operations in destroying mobile and small targets, particularly tanks, has revived interest in helicopters. It turns out that they possess a number of important advantages over aircraft, since they do not require costly airfields and they are able to change their flight altitude and speed very quickly and extensively. Moreover their high cargo carrying capability enables them to transport various types of guns, instruments and fire control equpiment.

These and other factors serve to define the future for helicopters, which at the present time are serving as a powerful means for destroying various ground targets.

Helicopters at the present time constitute an absolute majority of all of the piloted aviation vehicles being employed for military purposes. Using data obtained from the foreign press, let us examine some of their tactical-technical characteristics.

The flight range for helicopters is 500-1,500 kilometers. In addition to maneuvering successfully above a battlefield and furnishing fire support for ground subunits, they can also conduct reconnaissance of an enemy's forces and communications, ferry in airborne

troops and diversionary-reconnaissance groups and carry out strikes against various targets in the immediate rear and [also those] located at a great depth from the front line. In particular, they are able to attack tactical airfields, command posts, troops on the march, crossings, bases and warehouses.

The flight speed of helicopters may change drastically from zero to 300 kilometers per hour and more. If in this sense we view a helicopter as a target for antiaircraft gunners, then its low speed, compared to that of an aircraft, is considered to be a shortcoming since it will remain longer in the zone of fire of air defense weapons than, for example, a fighter-bomber. In addition, the accuracy of the antiaircraft gunners will increase under such conditions. With regard to the effective carrying out of combat and particularly gunnery tasks, these vehicles also possess certain positive qualities: comparatively low speeds, the ability to hover while aiming and firing at small mobile targets, etc.

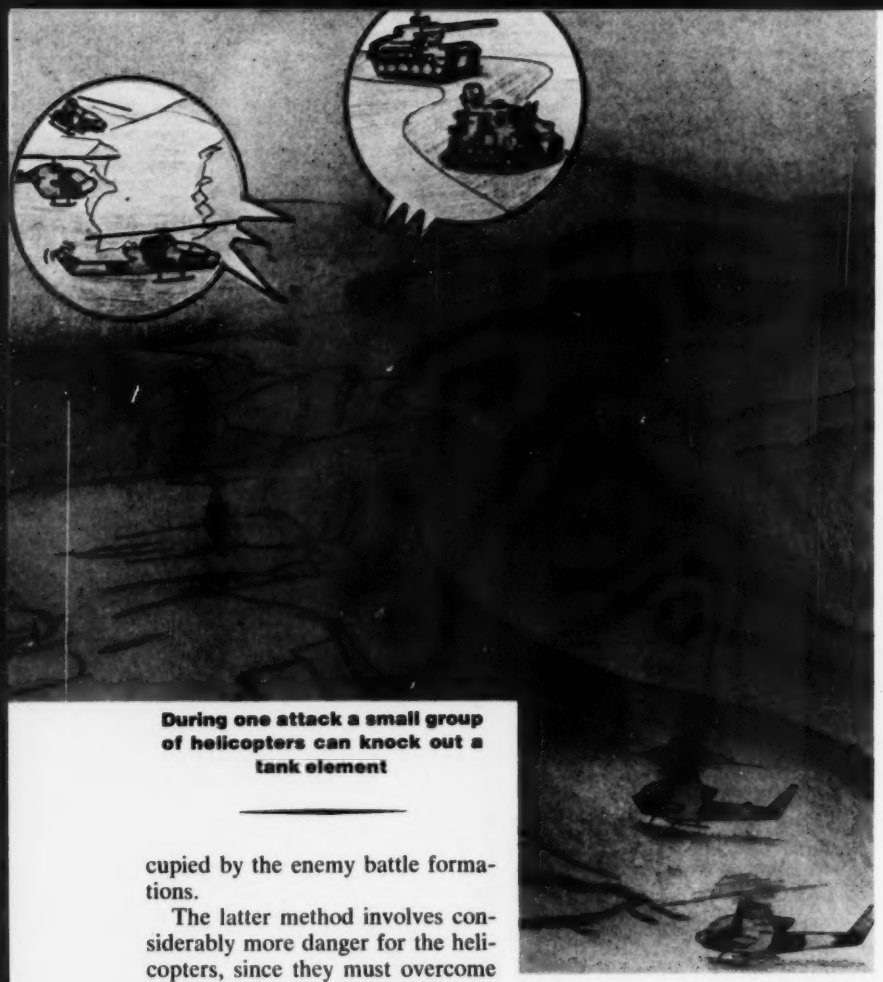
An important combat characteristic of helicopters is their rate of climb—8-18 meters per second. This means that within a matter of just several seconds a helicopter can surprise an enemy by suddenly taking off from a shelter and rising to an altitude that will enable it to observe the battlefield, select a target, destroy it and thereafter depart the area of shelling.

The practical ceiling of helicopters is 3,000-5,000 meters. But their maximum altitudes, as borne out by the foreign press, are rarely used, since their flight safety is related more to low altitudes where they are more difficult to detect by means of radar. Helicopters are able to approach the line at which they are to carry out a gunnery task in a secretive manner, taking advantage of the folds in the terrain.

Various types of armament are installed aboard a helicopter. For example, gunnery support helicopters may carry cannons and machineguns, antitank guided and free flight missiles, grenade throwers and also means for guiding their weapons. In this sense, helicopters differ very little from modern tactical fighter aircraft and, similar to the latter, they have at their disposal modern navigational equipment and instruments which ensure automatic piloting at low altitudes and also communication and reconnaissance equipment. On some types of helicopters the cabins for the pilots are protected by armor.

At the present time there is still insufficient experience available on the combat employment of helicopters. Thus the foreign authors maintain that it is difficult to reliably predict the various types of operations that they will carry out in battle. But nevertheless the foreign press is devoting a great deal of attention to questions concerned with the use of helicopters, particularly for fire support purposes.

In examining the tactics of helicopter subunits the foreign military press emphasizes that on each occasion they will perform on the basis of their onboard equipment, that is, taking into account their range of effective fire and the nature of the assigned task. In this regard, two methods are available for carrying out strikes against ground targets. The first method involves having the helicopters conduct their firing while located above the territory occupied by their own forces, that is, while behind their own leading edge. In the case of the second method, they will advance past the front line and operate over the territory oc-



During one attack a small group of helicopters can knock out a tank element

cupied by the enemy battle formations.

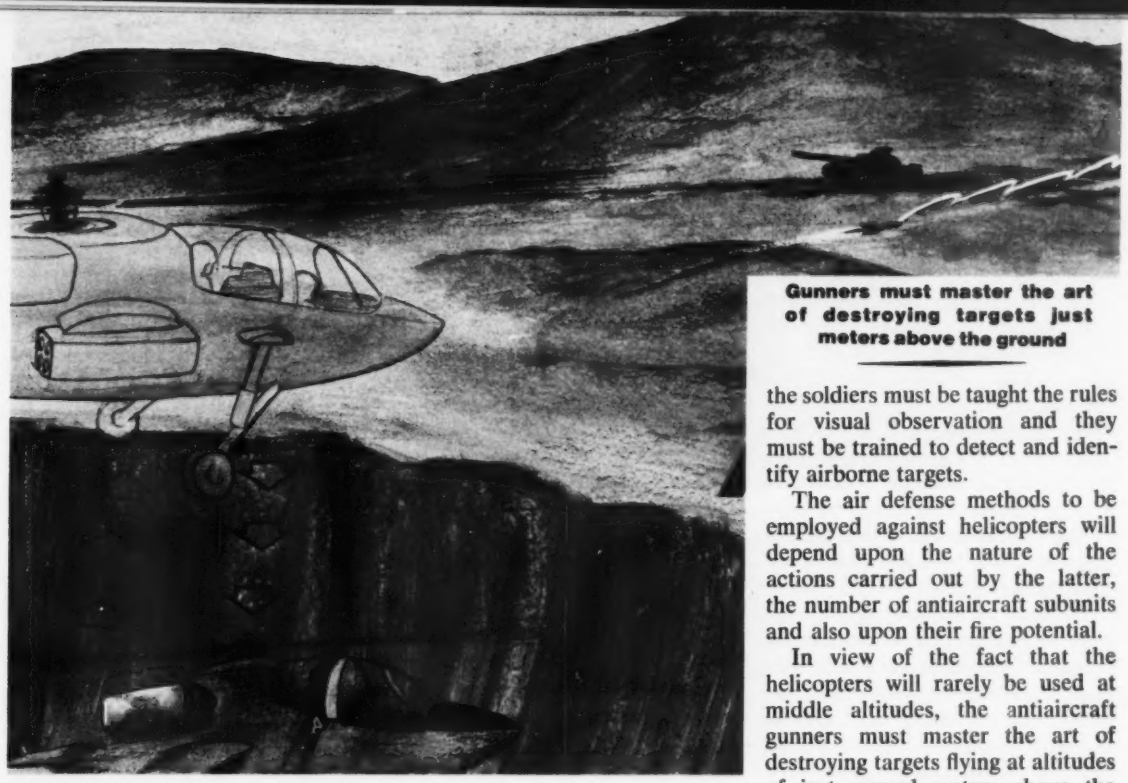
The latter method involves considerably more danger for the helicopters, since they must overcome the zone of fire of air defense weapons. Thus, when planning an operation in which helicopters are required to penetrate a territory occupied by the enemy for the purpose of conducting reconnaissance, ferrying in airborne forces or diversionary-reconnaissance groups or carrying out strikes against targets in the enemy's rear, full consideration must be given to the nature of the PVO [air defense] forces and the opportunities available for neutralizing them. Certainly, the foreign authors maintain that when deciding upon the flight sectors for helicopter subunits a preference should be shown for those sectors in which the PVO forces are weak and where conditions favor concealed flight operations at a low altitude.

What actions will be carried out by helicopters located above the territory occupied by their own forces? The foreign military specialists believe that under such conditions the firing will be conducted against various targets and particularly against the enemy tanks attacking along the leading edge of defense. Towards this end the helicopters will approach the line of contact between their own forces and the enemy and remained concealed behind natural or specially installed screens. At the moment of the attack, the crews, acting upon a signal issued by the combined-arms commander, will go aloft in their helicopters, approach the planned firing lines at a low altitude, occupy an advantageous position for firing and carry out their strike. It is obvious that the line for the timely landing of the helicopters (starting line) will be located at a distance from the leading edge such that losses caused by the artillery fire of the attacking enemy will be minimal and the firing line will be located where there are fewer antiaircraft weapons and where, prior to ascending for the purpose of firing, the helicopters will be able to conceal themselves behind local objects and conduct observation of the enemy actions.

Certainly, the foreign press has stated that the tactics of such mobile subunits as helicopter elements must be distinguished by special flexibility. For example, in order to force an enemy into dispersing the fire from his antiaircraft weapons, the helicopters may appear on a mass basis from various directions and carry out strikes both along the front and on the flanks. Nor can one exclude the possibility of a large number of helicopters being employed in the form of small groups.

In examining the possible actions that can be carried out by helicopters, the authors of the articles which appeared in the foreign military journals devoted a great amount of attention to their use in combating leading detachments and enemy advance guards. They maintain that fire support helicopter subunits can prevent the latter from carrying out their assigned tasks and in this manner they can sharply reduce the tempo of the offensive. This is particularly important during those instances when it is impossible to delay the advance of a strong enemy forward detachment through maneuvers being carried out by ground subunits.

Naturally, the point is emphasized in the articles that fire support helicopters must carry out a strike against a forward detachment prior to the latter being able to carry out its assigned task. In order to accomplish this, the direction of [helicopter] movement should be reconnoitered in advance . . . After



Gunners must master the art of destroying targets just meters above the ground

having selected an area in which maneuvering will be very difficult and also the organization of an effective air defense and deployment of tanks and other vehicles, a surprise strike should be carried out against the forward detachment.

It is by no means easy to repel such an airborne attack since helicopters can operate, as mentioned above, at low altitudes (down to 10 meters) and they are located in the zone of fire of antiaircraft gunners for 25-35 seconds in all, that is, for as long as is necessary to guide an antitank guided missile to its target. During this period of time the air defense subunit must detect the helicopter, turn its gun (launcher) in the direction of the target, lock onto it and remain prepared to fire as many projectiles as possible. Hence, every attempt must be made to reduce the amount of time required to detect the target and to make the required preparations for firing. In order to accomplish this, improvements must be realized in the system employed by platoons and batteries for reconnoitering an airborne enemy. In addition to a reconnaissance scout at a battery or platoon command post, all personnel must concern themselves with visually searching for the helicopters. Upon occupying a gun (launch) position, each gun crew must determine the sectors of observation, particularly in the direction of the front and flanks, where for the launch range of antitank guided missiles there are natural screens of the type usually employed by helicopters for concealment purposes.

The operators of radar sets, upon proceeding to reconnoiter the airborne targets, must first of all study well the locations and the nature of the signals being received from local objects, such that at any moment they will be able to distinguish their blips from those representing the airborne target flying at a low altitude. Naturally the officers, sergeants and soldiers must know the silhouettes of the fire support helicopters and possess the skill required to identify them in a rapid manner. Thus during specialized training exercises and drills the soldiers must be taught the rules for visual observation and they must be trained to detect and identify airborne targets.

The air defense methods to be employed against helicopters will depend upon the nature of the actions carried out by the latter, the number of antiaircraft subunits and also upon their fire potential.

In view of the fact that the helicopters will rarely be used at middle altitudes, the antiaircraft gunners must master the art of destroying targets flying at altitudes of just several meters above the ground. Here a considerable amount of importance is attached to anticipating the course to be followed by the helicopters and the targets of their strikes. If it is determined that the deployment of the antiaircraft subunits is not in keeping with the interests of air defense, then the deployment should be changed to ensure that the helicopters will appear within the range of effective fire of the PVO weapons.

Here a very important role will be played by antiaircraft ambushes, wherein a portion of the guns and launchers will be carefully concealed in the immediate vicinity of the anticipated helicopter course. Naturally one acquires the ability to predict the development of events only by persistently studying the tactics of helicopter subunits.

A very complicated task is that of combating helicopters which are firing antitank guided missiles while located above their own territory. In order to reduce to the maximum possible degree the time which elapses between detecting an airborne target and opening fire

against it, it is recommended that, once a position has been occupied, each gun or launcher be assigned a principal axis for firing in a manner such that it will divide the observation sector into two equal parts and pass through the point of probable appearance of the helicopter. After receiving his task the gun commander must determine the azimuth, the angle of sight of this point and the corresponding settings for the sight. In such a case the natural screens that could be used by the helicopters for concealment purposes, will be kept under constant observation.

During an attack against an enemy's leading edge of defense the constant support antiaircraft subunits must follow directly after the battle line of tanks and remain ready to immediately open fire against the helicopters and their commanders must be familiar with the direction of constant observation, that is, that local object where the airborne enemy may possibly appear.

When planning a change of position for antiaircraft subunits which usually fire from stationary positions, one should bear in mind that they should be "brought up" in a manner such that, during the period of artillery preparation, they change their positions and remain as close as possible to the line from which the helicopters are most apt to open fire with antitank guided missiles. Certainly, the routes for such movements and the gun positions must be located beyond the zone of fire of the enemy's direct firing weapons. In order to ensure that the degree of readiness of the antiaircraft subunits is not lowered too drastically, the movement to the new positions should in some cases be carried out on a gun-to-gun basis.

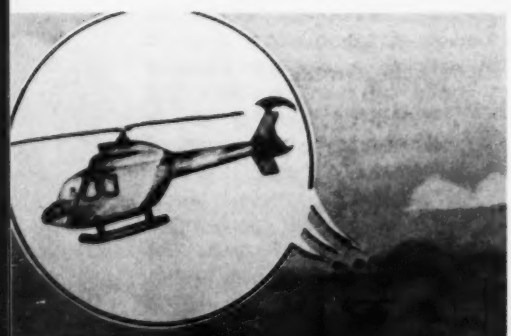
When organizing an air defense system for motorized rifle, tank and artillery subunits, it should be borne in mind that a small group of helicopters is capable, during just one attack, of knocking a tank element out of action and even a forward detachment. Thus, in the interest of protecting the latter, one should assign highly mobile antiaircraft subunits that are capable of firing at airborne targets while moving or during very brief halts. In the process the antiaircraft units should ideally be distributed in a manner such that a portion of them are located at the head and the remaining portion in the middle of the column.

The distances between the antiaircraft units and other vehicles must not be less than 50 meters. This ensures freedom of action for the antiaircraft personnel when firing at low-flying targets. The right to open fire against the helicopters belongs to the commander of a unit. Thus he is responsible for the timely detection and identification of the airborne enemy. In this regard he must assign the march task in an efficient manner and indicate the sector for observation and firing relative to the column's movement (to the right, to the left, forward, backwards). In this manner he will be able to organize correctly a search for the targets and display initiative during a complicated situation.

When protected forces are required to transit narrow areas along a route (bridges, defiles, crossings, etc.), all units must remain in readiness to immediately open fire in their sectors and their commanders must maintain constant observation of the airspace.

If airborne targets are detected (helicopters), the antiaircraft gunners will fire at their maximum possible tempo. Interludes in the firing will be tolerated only in those instances where the gunners have lost their targets and such interludes will then be used for introducing firing corrections.

The same holds true for the missile personnel. During the period that a helicopter is searching for its target on a battlefield and aiming its antitank guided missiles, the missile personnel will be able to launch from one to several missiles. When the probability of destruction of a helicopter with just one missile is low, the subunits, depending upon the situation, may simultaneously launch several missiles without waiting upon the results of the first launches. This is particularly important in those instances where the airborne targets are operating at low altitudes and a complicated radio jamming situation has developed. Where favorable firing conditions are available and also in those instances where a need exists for simultaneously shell-



Fire support helicopters can sharply reduce the tempo of enemy advance detachments

If airborne targets are detected, gunners will fire at maximum possible tempo

ing several helicopters, each target should be destroyed using one missile.

It should be borne in mind that helicopters can operate simultaneously with tactical aviation and carry out strikes "on the sly" against troops and antiaircraft subunits, immobilized by firing at aircraft. Thus during all battles against tactical aviation, one must always anticipate the possibility of having to transfer the fire of a portion of the units (guns) against helicopters. This task should be assigned to the best trained crews.

A brief signal ("above the first helicopter") should be established for shifting fire. In response to this signal the designated units (guns) will commence independently to carry out the combat task. The shifting of fire from aircraft to helicopters up until the end of the firing (with the exception of cases involving self-defense) is hardly advisable.

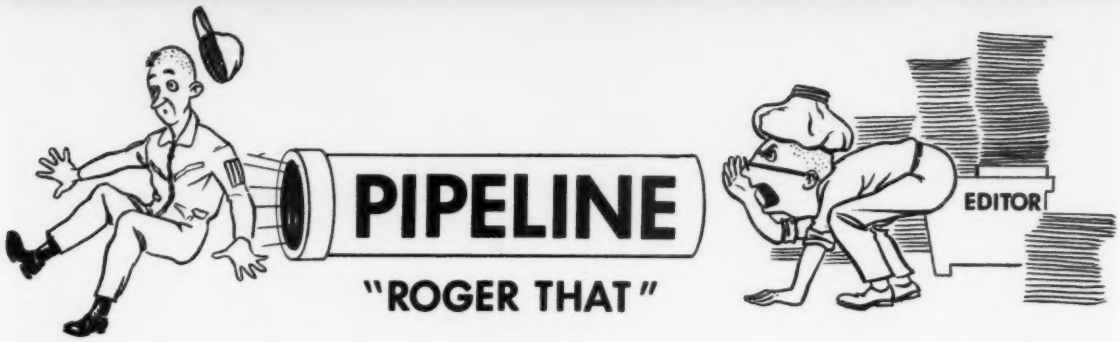
Tank antiaircraft machineguns and also rifle weapons can be employed effectively against helicopters. Certainly, it will be difficult for the crews of tanks that are constantly engaged in battle against ground forces to detect a helicopter in a timely manner and yet they are obligated to maintain aerial observation.

The waging of battle against an airborne enemy requires that the antiaircraft gunners display a high degree of combat expertise and the ability to employ their weapons with the maximum degree of effectiveness. The knowledge and skills required for combating helicopters are usually acquired during the course of exercises, drills and firing practice. Thus conditions must be created during these exercises and drills that will enable the personnel to master the means and methods to be employed when firing against such targets. Firing against helicopters must occupy an important place among the combat and training gunnery tasks usually carried out by antiaircraft gunners, tank personnel and motorized riflemen.

The personnel must be taught to fire against such targets both while stationary and while moving and they must devote particular attention to questions concerned with target detection and identification, target acquisition, rotating a gun (unit) 90 and 360 degrees, loading, locking-on the target and commencement, conduct and termination of firing. Particular importance is attached to evaluating the speed and accuracy with which these operations are carried out and ensuring that a reduction occurs in the amount of time required to do so. The effectiveness of firing should be evaluated not on the basis of grouping the traces to the target, but rather according to the number of direct hits, that is, a positive grade is assigned only if bullet holes are observed.

Naturally, in order to work out questions concerned with firing at helicopters and carrying out field firing against them, an appropriate training equipment base must be created. The units have accumulated a considerable amount of experience in this regard. At some antiaircraft polygons, in the regions of moving target gunnery ranges for ground targets, some rather simple devices have been prepared for raising targets which, in terms of their configurations and dimensions, correspond with the silhouettes of helicopters. The firing at such targets is not as simple as it might seem at first glance. The principal difficulty is that very little time is available for carrying out the gunnery task—only as much as would be available in actual battle. Only well trained subunits can successfully overcome this difficulty. Obviously, firing against helicopters will in the future become a component part of a multitheme gunnery task. Hence, in order to achieve success during such firing, the personnel of antiaircraft subunits must master all firing methods, to include those used against both aircraft and helicopters. In order to accomplish this, the exercises and drills should involve the participation not only of "enemy" fighter-bombers but also helicopters.

The problem of combating helicopters has many facets and problems that are still awaiting solutions. It is to be hoped that the discussion raised on these pages will be continued in subsequent issues of the journal.



Here are your comments based on the DIGEST's 1974 survey

THE "PIPELINE" has done its job. We now have analyzed 1,500 answers to the survey published in the January 1974 issue of the U. S. ARMY AVIATION DIGEST and will share the results with you. Overall the DIGEST received a solid endorsement—in fact 97.3 percent found the magazine helpful or interesting, or both.

There were 1,116 who felt that the magazine helps them in their work, while 754 said they find the magazine interesting (400 found it both interesting and helpful). Only 30 checked "Ugh!"

On the "Pipeline" tearsheet we listed the categories of articles the DIGEST has been covering and asked if you want us to print more, the same amount or less of each. Your responses revealed a desire for more stories on instrument flying; developments; and safety (accident prevention). Also, more stories are wanted on air traffic control, research, maintenance and weather.

We are taking steps to increase the number of articles we publish in categories in which you expressed a desire for increased coverage. The November issue will feature accident prevention and December, air traffic control. Next year we will have issues featuring research and development, maintenance, weather and instrument flying. (See May 1974 DIGEST, page 19, for a list of projected themes and how you can participate with us in the preparation and presentation of these themes in future issues.)

We apparently are printing the desired amount of articles concerning training, armament, avionics, humor, medicine, history, and combat and flying experiences. The survey did not produce an outcry against any of the categories we cover. The largest "No" vote came from 358 readers who want less articles dealing with combat experience (see chart). However, these articles teach a point or record lessons learned that help mold current tactics, techniques and doctrine.

One question asked was: What other aviation publications do you read? The DIGEST does not compete with these magazines, but if you have limited access to other periodicals the DIGEST can reprint or expand those articles our colleagues publish that are of value to Army aviation personnel.

The survey included a comment section designed to give the DIGEST's readers a chance to express their feelings in more detail. Here are some of the comments: The story that received the most favorable comments was "The Other Side Of The Coin" (January 1974). This article reviewed Army aviation's accomplishments through the years in the mercy mission field. It was so well received that we are planning to print a similar article each January. However, we will be expanding this "roundup coverage" into all areas in which Army aviation has been significantly involved during the previous 12 months.

Coverage of the Military Assistance to Safety and Traffic (MAST) in the November 1973 and January 1974 issues pleased many readers. Other stories singled out for praise were "Honor Times 29" (January 1974) and "The Army Aviator's Sheet Music" (April 1974). In the same issue with "The Army Aviator's Sheet Music" several articles on standardization were cited. Among the other stories liked are " 'Pre' Instrument Flight" (December 1973), "Supervision—The Key To Accident Prevention" (January 1974), "Biorhythms" (January 1974), "Write To Right" (November 1973) and "When Landing Is Assured" (January 1974). The January 1974 issue received several compliments (this was the issue the survey appeared—could this have something to do with it?).

Not all of the DIGEST's articles were well received. The "Icing . . ." story (January 1974) received a few bad comments and "Biorhythms" was liked by many readers but rapped by a few. One reader said

he did not like nap-of-the-earth stories.

Almost 400 readers wrote in the comments column that they like the DIGEST just as it is (sweet music to our ears) while six said they did not. Some described the DIGEST's coverage as being too broad, but other endorsed its variety. Some want the magazine to be less technical while an equal number want it more technical. A similar 50-50 type breakout has occurred in all of our past surveys. Even though we can't please all of the people all of the time, we can try. The mission of the DIGEST is to provide information on safety, training, maintenance, operations, research and development, aviation medicine and related subjects to ALL personnel associated with Army aviation. This spectrum includes for instance: Infantry; the Transportation Corps; Army Reserve units—in short, anyone who is interested in us we have an interest in them.

By the comments it's obvious that many readers want "more DIGEST." Some suggest that articles be longer and others want the magazine to increase its number of pages. One reader wants us to increase the number of issues we print each year (we now print one issue each month). The biggest gripe is that not enough copies can be obtained. We have even received complaints that the magazine is always late. (The magazine is on pinpoint distribution. The inside front cover of the DIGEST each month tells you how to obtain the magazine.)

So many readers suggested possible articles that we can't list or even summarize them all. But, the list includes suggestions such as articles on the National Guard and Reserves, aviators, emergency procedures, aviation in the nuclear environment, visual flight rules (VFR) and instrument flight rules (IFR), fuel conservation, an article directed toward enlisted men and how they can get into the flying warrant officer program, civilian aircraft, articles of interest to the U. S. Marines, congressional legislation, and aircraft capabilities and limitations.

Some wanted to recall "Charlie and Danny" and to put "Frozzleforth" back on active duty. Others want more flying experience articles such as the DIGEST's new instigated "Flying Thru—The Only Way To Grow" feature.

One reader thinks we run too many Fort Rucker articles and another doesn't like survival stories. "Pearl" got a lot of mail, some good and some bad.

The survey proves that the DIGEST now is playing a new and important role in this period of restricted flying. Many aviators are assigned to nonflying duties; many to the National Guard and Reserves. These form a large contingent who depend on the DIGEST to help keep abreast of the latest in aviation. Also, reaffirmed is the fact that the magazine is read extensively by nonrated ground forces personnel to learn what aviation can do for them.

A survey does not provide all of the answers concerning our readers' wants and needs. The only way we can really know what you want is when you tell us. Our survey is not over, however. Our main data input is still to come—the letters you send which give specific explanations of how you feel are our most valuable guides. If you have any constructive suggestion please write: Editor, U. S. ARMY AVIATION DIGEST, P. O. Drawer P, Fort Rucker, AL 36360; or call AUTOVON 558-6680/3619. We're always happy to hear from *you*!

I feel the DIGEST is:	
Helpful	1,116
Interesting	754
Ugh!	30

I prefer articles on:			
	Same	More	Fewer
Avionics	728	236	192
Armament	620	230	290
ATC	464	688	94
Inst. Flying	338	894	62
Humor	660	230	92
Maintenance	536	622	98
Medical	640	294	170
Research	458	652	138
Developments	478	716	78
Safety	464	752	52
Tactics	594	398	216
History	562	342	10
Training	892	516	128
Combat Exp.	560	274	358
Weather	478	524	84
Accidents	528	708	66
Flying Exp.	530	506	138

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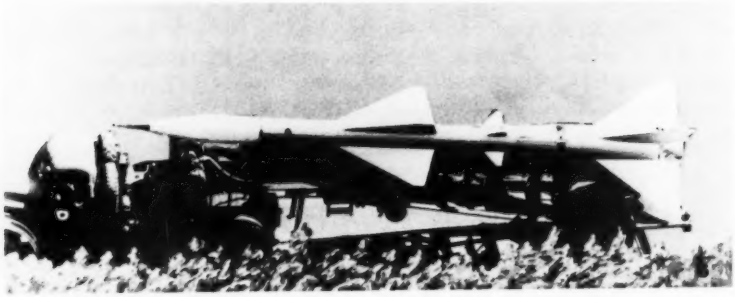

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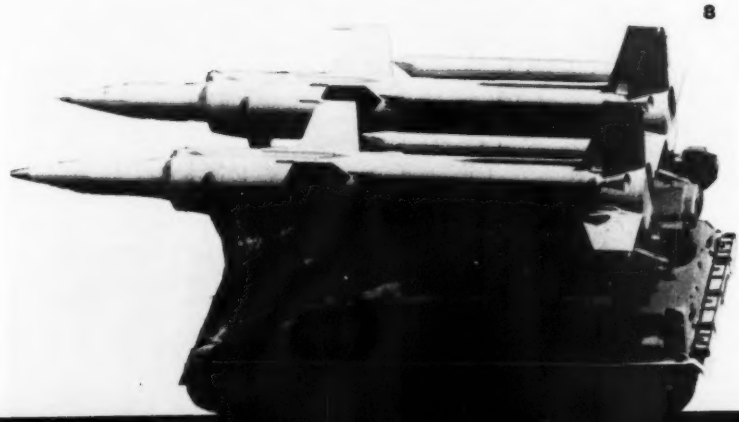

THREAT

Continued from page 1

the MILITARY HERALD. The author, a Soviet general, is quoted in part as follows:

> When organizing an air defense system for motorized rifle, tank and artillery subunits, it should be borne in mind that a small group of helicopters is capable of knocking a tank element out of action . . . Thus, one should assign highly mobile antiaircraft subunits that are capable of firing at airborne targets while moving or during very brief halts . . . Firing against helicopters must occupy an important place among the combat and training gunnery tasks usually carried out by antiaircraft gunners, tank personnel and motorized riflemen.

In providing the necessary air defense for its field forces, the Soviet Union has developed a modern and extensive arsenal of air defense weapons systems consisting of tactical aircraft, missiles, antiaircraft artillery and vehicle mounted machineguns. Furthermore, the Soviets make maximum use of individual and crew served weapons in an air defense role. These weapons systems, augmented by a wide assortment of electronic warfare equipment, could have a significant impact on U. S. Army airmobile operations.

The principal aircraft which may currently be encountered are the Mig-21 Fishbed (1) and the SU-7 Fitter (2). The Fishbed is an all-weather, single seat jet fighter ca-

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5: SU-11 Flagon

6: SA-2 Guideline

7: SA-3 Goa

8: SA-4 Ganef

pable of speeds in excess of Mach 2 and a combat radius of 550 kilometers. Armament includes cannon, rockets and the ATOLL air-to-air missile similar to the U. S. Sidewinder. The Fitter is also a single seat jet fighter, but is somewhat slower and has a shorter combat radius than the Fishbed. Armament includes rockets, cannon and bombs. There is a variable geometry version of the Fitter with improved takeoff performance and range.

Later model fighter aircraft include the Mig-25 Foxbat (3), the Mig-23 Flogger (4) and the SU-11 Flagon (5). Foxbat, which has reportedly been seen in Egypt, is capable of speeds of more than Mach 3 and has a combat radius of more than 1,100 kilometers. Both the Flagon and the variable geometry Flogger are capable of speeds in the Mach 2.3 range and combat radii of around 700 to 900 kilometers, respectively. Many of the older aircraft such as the Mig-17 and the Mig-19 remain in service and may be encountered.

Rapidly assuming predominance in the Soviet air defense arsenal are surface-to-air missiles with overlapping high, medium and low altitude coverage and the ability to move with ground forces for air defense. These missiles include the high altitude SA-2 Guideline and the low altitude SA-3 Goa, both known from the Vietnam war; the medium and high altitude SA-4 Ganef, the highly mobile SA-6 Gainful and the SA-7 Grail, handheld like the American Redeye and reported to be mounted on vehicles as well.

The SA-2 Guideline (6), standard in the Soviet Army and

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9: SA-6 Gainful

10: SA-7 Grail

11: S-60 millimeter gun

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throughout the Warsaw Pact and Soviet-backed countries, is the first of the transportable surface-to-air missile systems. Mounted on a ZIL 157 semitrailer transporter-erector, it is land mobile. It is employed with a track-while-scan radar. It has radio command guidance. Guideline's mobility and low altitude capability are limited.

The SA-3 Goa (7) which followed the Guideline is thought to have been intended for much the same operational role as the U. S. Hawk—short range defense against low flying targets. Goa is a small, two-stage solid propellant surface-to-air missile and is carried in pairs on the ZIL 157 truck. Both the Goa and Guideline were extensively deployed in Egypt.

The next of the surface-to-air missiles to appear was the medium and high altitude SA-4 Ganef (8). First seen in 1964, it is transported in pairs on an armored tracked vehicle which also serves as the launcher. The system is thus highly mobile and can be brought into action rapidly. Ganef has a range capability comparable to the SA-2.

A relatively recent addition to the Soviet air defense arsenal is the SA-6 Gainful (9). First appearing in the Moscow November parade in 1967, the SA-6 was an unknown quantity at the outbreak of the 1973 Middle East conflict where it reportedly proved extremely effective against Israeli aircraft. The highly mobile Gainful surface-to-air missile's role is low altitude defense. This weapon, along with the SA-7, has greatly

improved Soviet low altitude missile capability.

The newest addition to the Soviet air defense missile system is the SA-7 Grail (10), a low altitude surface-to-air missile which was introduced into Warsaw Pact armed forces about 6 years ago and was encountered in combat during the North Vietnamese 1972 spring offensive. The SA-7 is a heat-seeking missile similar to the U. S. Redeye. It can either be fired by one man or mounted on vehicles. The SA-7 has been used against both U. S. aircraft in Southeast Asia and Israeli aircraft in the Middle East.

Although as already mentioned surface-to-air missiles are rapidly assuming the dominant role in the air defense system of the Soviet ground forces, they have not displaced conventional antiaircraft weapons. Antiaircraft guns currently available for use by Warsaw Pact ground forces for air defense range in caliber from 14.5 to 100 millimeters, although the older 37, 85 and 100 millimeter guns are believed to have been largely phased out of active service.

A significant antiaircraft gun of the Soviet ground forces is the 57 millimeter S-60 (11), a post-World War II development. It is a recoil operated, towed weapon which has replaced the earlier 37 millimeter models in most Warsaw Pact units. The S-60 employs both oncarriage and offcarriage fire control. It has a tactical antiaircraft range of 6,000 meters and a cyclic rate of fire of 105 to 120 rounds per minute. Another 57 millimeter antiaircraft gun, the twin self-propelled ZSU-57-2 (12), made its appearance in the late fifties and is still found in antiaircraft units of tank regiments in most Warsaw Pact countries. The ZSU-57-2 mounts two 57 millimeter guns on a modified T-54 tank chassis. These guns are ballistically similar to the S-60 gun; however, an optical mechanical computing sight is the only fire control method available for the ZSU-57-2. The system has a tactical antiaircraft range of 4,000 meters.

The Soviet light towed antiaircraft gun ZU-23 (13), which ap-

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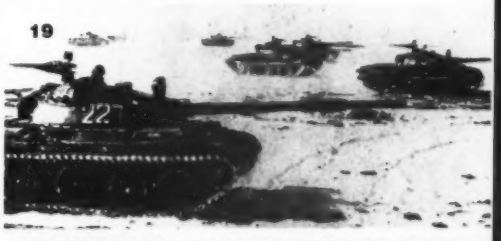

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12: ZSU-23

13: SU-23

14: ZSU-23-4

15: ZPU-4

16: APC mounting 12.7 mm M38/46

17: APC mounting 14.5 mm KPVT

18: T-55 tank-mounting 12.7 mm machinegun

19: T-62 tank-mounting 12.7 mm machinegun

20: 7.62 mm AKM assault rifle

21: RPK squad automatic weapon

peared in the early 1960s, is replacing the older quad 14.5 millimeter antiaircraft heavy machinegun ZPU-4 in many Warsaw Pact armies. The ZU-23 consists of twin 23 millimeter guns mounted on a towed two-wheel carriage. It can fire 800 to 1,000 rounds per tube per minute to an antiaircraft range of 2,500 meters.

A self-propelled system mounting four 23 millimeter guns, and featuring a completely integrated fire control system, was introduced by the Soviets in 1965 and is now found in several Warsaw Pact armies. The ZSU-23-4 (14) is mounted on a light tracked chassis. Its onboard radar is believed to have both target acquisition and target tracking capabilities. Employed along with the SA-6 Gainful missile in the October 1973 Middle East war, the ZSU-23-4 reportedly scored great success against Israeli aircraft, especially when the aircraft maneuvered to evade the SA-6.

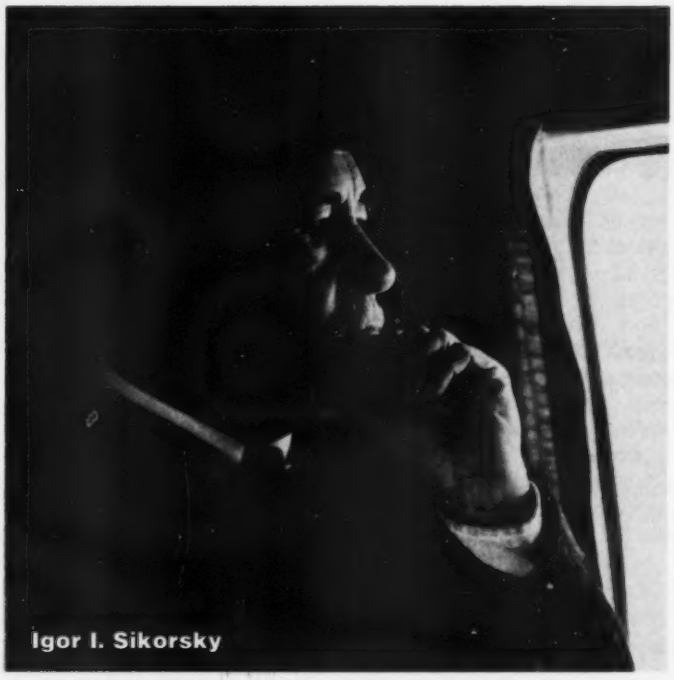
One other antiaircraft weapon system still used widely within the Warsaw Pact and which is particularly well suited for defense against low flying aircraft is the Soviet 14.5 millimeter heavy machinegun ZPU-4 (15). This weapon system consists of four 14.5 millimeter machineguns mounted on a four-wheel towed carriage. It has a cyclic rate of fire of 600 rounds per minute per gun and a tactical antiaircraft range of 1,400 meters.

Vehicle-mounted machineguns also present a hazard to airmobile operations. The 12.7 millimeter machinegun is widely used on armored personnel carriers (16), as is the 14.5 millimeter (17). These weapons have tactical antiaircraft ranges of 1,000 and 1,400 meters, respectively, and rates of fire per barrel of 600 rounds per minute. Other armored vehicles mounting machineguns which may be encountered include the T-55 (18) and the T-62 (19) medium tanks.

The Soviets supplement their air defense systems with various infantry weapons such as the 7.62 millimeter AKM assault rifle (20) and the RPK squad automatic weapon (21). Soviet infantrymen are trained to engage all enemy aircraft, particularly helicopters. This special training is further emphasized by the same Soviet general officer quoted previously. "Tank antiaircraft machineguns and also rifle weapons can be employed effectively against helicopters. . . ."

As stated previously, the air defense weapons systems are augmented with a wide assortment of electronic warfare equipment and the Soviets can be expected to make extensive use of this equipment to disrupt communications and navigation radars necessary for effective airmobile operations.

In summary, the Warsaw Pact threat to airmobile operations extends across a broad spectrum of weapons, ranging from small arms to antiaircraft artillery, and from surface-to-air missiles to tactical aircraft. This combination of systems provides the Warsaw Pact ground forces with a continuous and quick reaction air defense capability to counter airmobile operations.

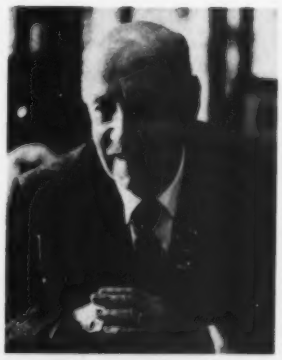


Igor I. Sikorsky

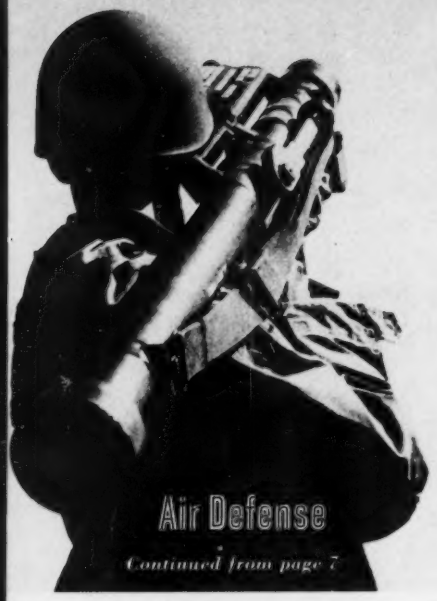
Last month the DIGEST carried an article on the dedication of the U. S. Army Aviation Hall of Fame and we named the first seven inductees. We promised followup articles telling you a little more about each. This is the first, featuring Igor I. Sikorsky

ARMY AVIATION HALL OF FAME

IGOR I. SIKORSKY's interest in rotary wing flight first manifested itself in 1909 when he produced two unsuccessful experimental helicopters in Russia. His visionary efforts are the foundation of the technology that is basic to modern helicopters worldwide. In constructing the VS-300 30 years later, Mr. Sikorsky solved the problem of antitorque control and developed a successful rotor head which incorporated features that enabled the pilot to control motion in all directions. These cyclic and collective pitch control features are incorporated in virtually all helicopters today. Sikorsky designed UH-19 and CH-34 helicopters have seen extensive Army service in a variety of missions. They provided the Army one of its earliest capabilities to exploit airmobility with utility and cargo helicopters. The UH-19 was the first cargo helicopter in the Army inventory to see combat during the Korean War. The CH-34 was the first helicopter approved for Army use as a presidential executive transport vehicle. It was followed in this role by the Sikorsky VCH-3. Development of and use by the Army of Sikorsky CH-37 medium cargo and CH-54 heavy lift helicopters are further tributes to the engineering genius for which he is renowned. This aviation pioneer, the father of today's Army helicopter fleet, retired from active engineering work in 1957. Mr. Sikorsky died in 1972.



This is one of the last pictures of Mr. Sikorsky. It was taken shortly before his 83rd birthday, 25 May 1972 in his office at the Stratford, CN, plant



Air Defense

Continued from page 7

Redeye missile gives battalion and company sized units their own air defense weapon to counter low level attacks

Chaparral is an infrared heat seeking surface to air missile for use in forward areas against air attack

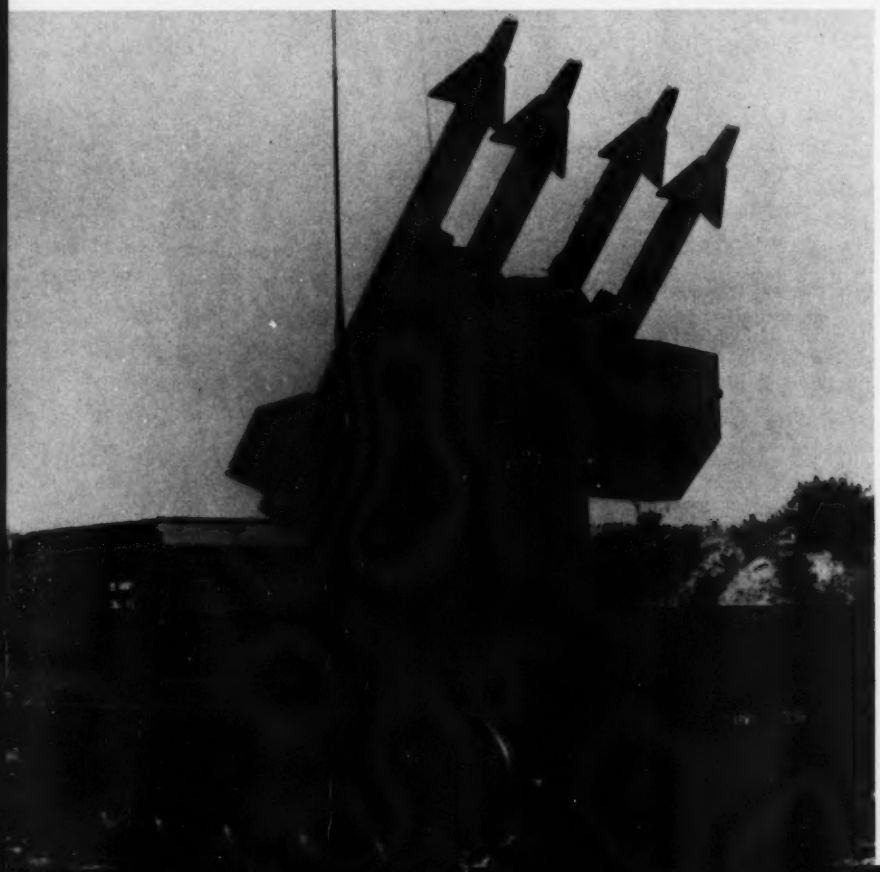
sees an aircraft until the aircraft releases its ordnance and is out of his range. By easing his identification problem, we allow him more time to place fire on the target, thereby increasing his chances of downing the aircraft. In some situations, therefore, it may be best—it may be safest—for you the Army aviator when ADA is on a *weapons free* status. You may prefer to stay down and hidden while ADA clears the skies for you.

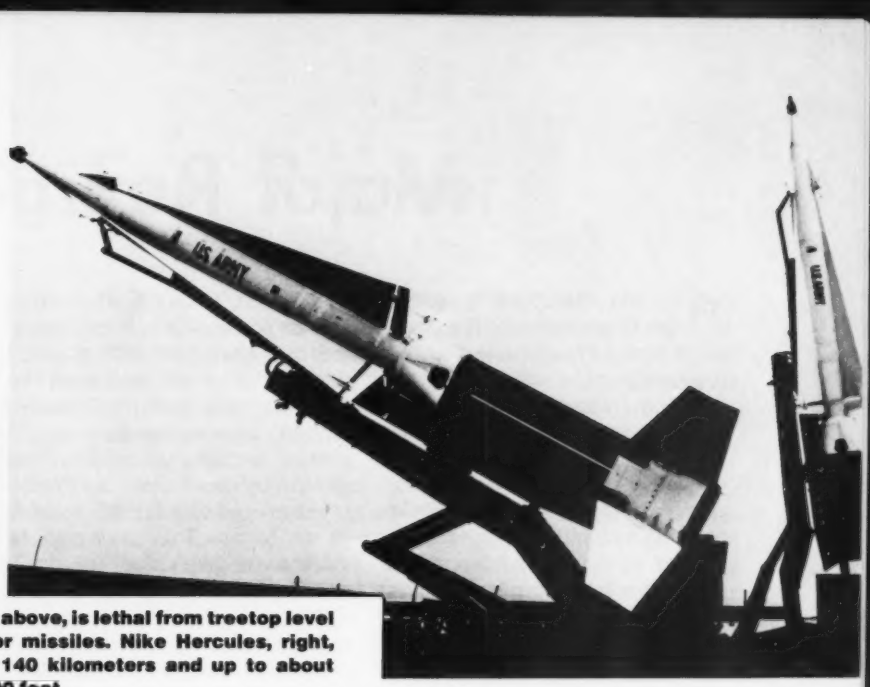
Aviation and ADA can work together to the mutual advantage of both. For example, suppose a composite Chaparral and Vulcan battery has been assigned the mission of protecting a division airfield, a critical and vulnerable asset. In this situation it may be best to establish a restricted area with safe passage corridors in and out. ADA could fire on any aircraft attempting to penetrate the restricted area along any route outside the established corridors. Within these corridors we have *weapons tight.* (Positive ID as hostile would apply.) Thus, your chances of survival against enemy air attack are enhanced with little or no interference with your operations.

Some additional food for thought while we're on the subject of weapons control and aircraft identification — flying nap-of-the-earth (NOE) may not be the safest in all situations. By "popping up" on the ADA gunner, particularly in a *weapons free* environment, you increase the risk of misidentification. When operating behind our lines it just could be safer for you to fly a few feet higher, giving the ADA gunner more time to eyeball you on the way in.

To effectively coexist with short range air defense, the aviator needs to stay abreast of the rules and procedures under which these weapons are operating. In particular, he should be aware of any *weapons free* and restricted areas.

I think you begin to see that a great deal of coordination is required between aviation and ADA if both are to perform effectively in the forward combat area. The organization to facilitate this close coordination does exist within the division. Representatives from the aviation, Chaparral/Vulcan and Hawk battalions sit side-by-side in the airspace control element (ACE) of the division tactical operations center. Don't get the idea that the ACE is going to exercise minute-to-minute control over all users of the airspace. It neither has that capability nor the requirement to do so. It can and does perform bulk management of the airspace through planning and implementation of procedures which best serve the needs of both aviation and ADA. This is accomplished within the framework of the overall rules and procedures set down by higher air defense authority and in consonance with any guidance from





Hawk (Homing All the Way Killer), above, is lethal from treetop level to 45,000 feet against aircraft or missiles. Nike Hercules, right, engages high speed aircraft to 140 kilometers and up to about 100,000 feet

the division commander and G3.

Since the Army owns most of the helicopters employed in the forward area, the Air Force commander will normally look to the Army for advice on rules and procedures for ADA engagement of helicopters and may allow the ground commander considerable latitude in the implementation of his directives. Generally speaking, the ground commander can make the rules for engagement for ADA more restrictive but not more lenient. Don't think that just because the Air Force has overall responsibility for air defense and airspace control there is a "big blue-suiter somewhere in the sky" who is going to dictate your every action. Knowing the basics of how ADA operates you, the Army aviator, can make recommendations as the tactical situation develops for changes in procedures to allow you to perform your mission most effectively under the protection of ADA.

The presence of the Hawk battalion within the division area provides the necessary coordination link with the Air Force on air defense and airspace control measures. The Hawk battalion operations center maintains communications with its parent group which, in turn, maintains an element with an Air Force control facility. A concept being developed by the U. S. Army Air Defense School at Ft. Bliss, TX, provides for the collocation of an element of the division's flight control center with the Hawk battalion operations center. This permits the use of Hawk radars in airspace management and further strengthens the ties between aviation and ADA.

Even in peacetime, in some parts of the world an awareness of air defense control measures is essential to the Army aviator's safety. You may have heard or read about the U. S. helicopter recently shot down by the South Koreans when it allegedly overflew the presidential residence of Chung Hee Park—a restricted area. Why, when it clearly bore U. S. markings? Without knowledge of the details of the particular case, it would be difficult to say; but recall, according to air defense rules and procedures, *any* aircraft within a restricted area would be considered hostile to the air defense gunner—no further attempt at identification required.

It pays to learn and to stay informed on air defense rules of engagement. Here, we've only touched on a few possible air defense control measures. To know the procedures in your command get out the SOP governing air defense and read it thoroughly. Only with your complete understanding of these procedures can Army aviation and air defense artillery work together effectively as a team.

Colonel Kilgore earned his aviator's wings in 1956 and has served in flying assignments in the United States, Vietnam and Europe. He has commanded Air Defense Artillery units both at battery and battalion level in the U. S. and Korea

Major Reorganization I

One of the principles of war is supposes a unity of effort w financial stringencies, the u every command. Accordingly the artificial walls that have a greater unity

AT FT. RUCKER's request, the Department of the Army, on 14 May 1974, approved a major reorganization of the U. S. Army Aviation Center/School organization. Because Ft. Rucker is a small post with all of its elements ultimately striving for a single purpose, i.e., the creation of aviation doctrine and trained personnel for the rest of the Army, its organizational lines have been redrawn. As a result, those who provide the training and doctrine and those who support them now very much are on the same team. We now are known simply as the U. S. Army Aviation Center.

Not only is a unity of effort attained, manpower and equipment resources are conserved. This came about through integration of the former Center and School staffs.

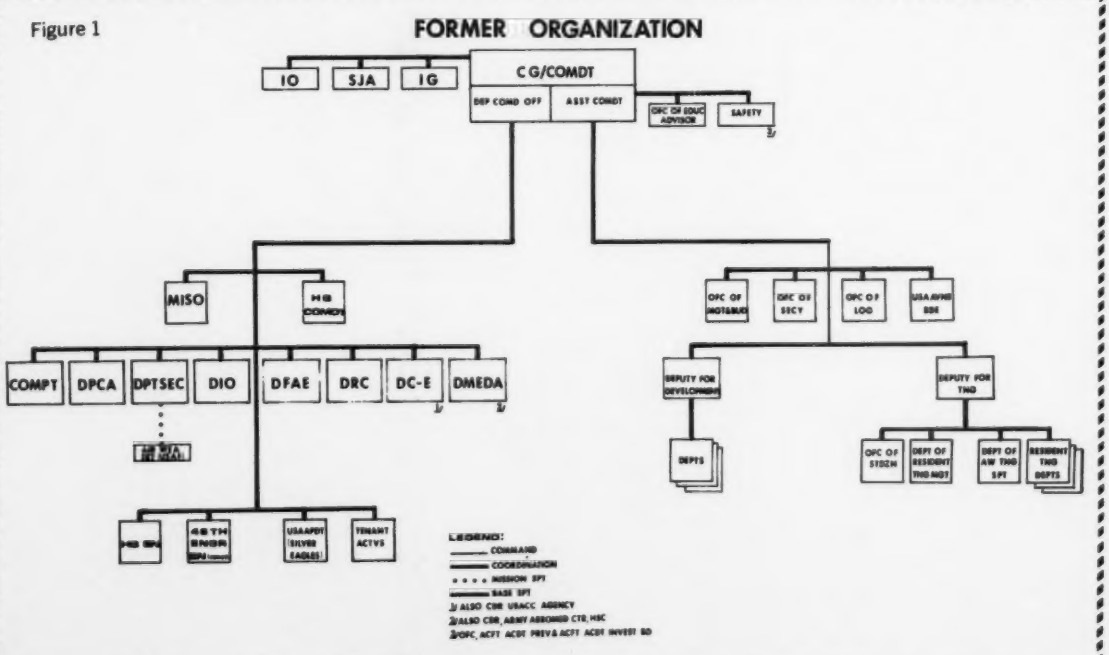
With the focus of all Aviation Center personnel sharpened under the new integrated staff structure, there now occurs increased cooperation, less need for interoffice written communication and increased managerial flexibility. Staff groups are freed from the burden of the myriad coordination inherent in the former dual structured environment. The changes are coming in two phases.

Phase I of the reorganization primarily concerned director/supervisor levels of the various staffs; this was planned as a transitional vehicle. It was implemented as soon as approval was received. Affected staff elements were realigned as intact modules, where possible, under operational control of the gaining elements. Figure 1 reveals the former dual structure while figure 2 points out the new alignment of elements Phase I created.

Major organizational changes in the restructured Aviation Center are:

• Manpower Management Division, Office of Management and Budget (OMB) was combined with Force Development Division, Di-

Figure 1



Implemented At Fort Rucker

**ar is unity of command. This principle pre-
rt within the command. In these days of
e utmost in unity of effort is required in
ngly, Ft. Rucker has taken steps to level
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ity of effort can be achieved**

rectorate of Plans, Training and Security (DPTSEC) to form a new nondirectorate staff element, the Office of Force Development. As a result, all force development/manpower functions at the installation were consolidated into a single organizational element.

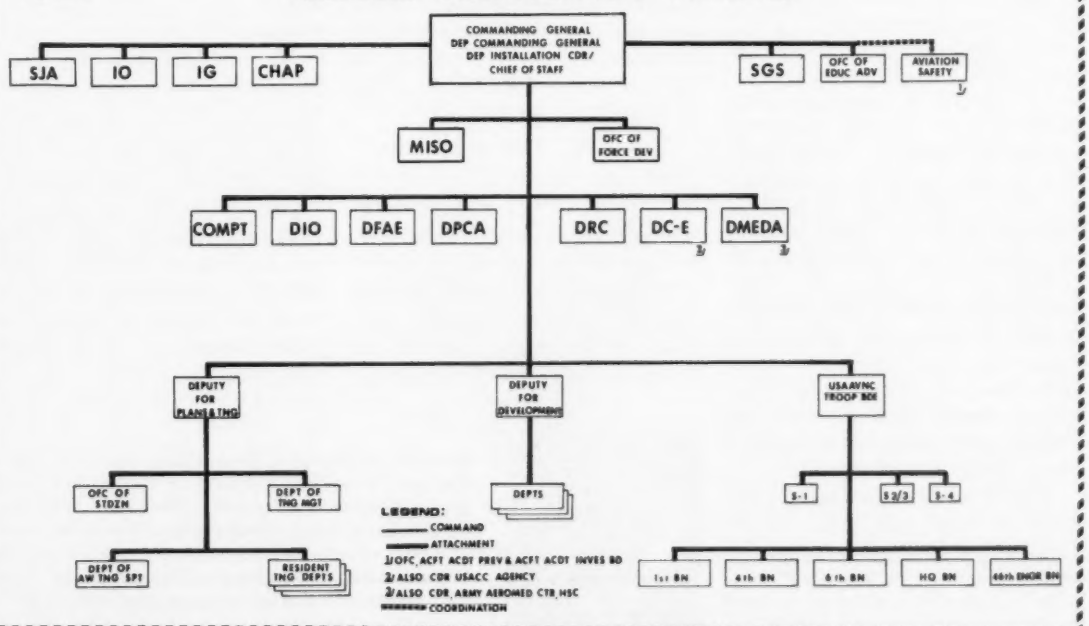
- Office of Secretary was integrated with the Directorate of Personnel and Community Activities (DPCA). Combining these two elements centralized the responsibility for all installation personnel management and administrative type functions.
- The major portion of the former DPTSEC organization is realigned with the Deputy for Training. This realignment places all plans and training activities under the control of a single individual. The U. S. Army Aviation Museum and the Intelligence Division (which deals primarily with personnel security clearances) were realigned with DPCA.
- Headquarters Battalion and 46th Engineer Battalion, U. S. Army Forces Comamnd (FORSCOM), were attached to the Center Aviation Troop Brigade. As an official FORSCOM unit, the 46th Engineer Battalion retains its original mission. The attachment of these two battalions to the Brigade consolidates all installation troop units under a single commander.

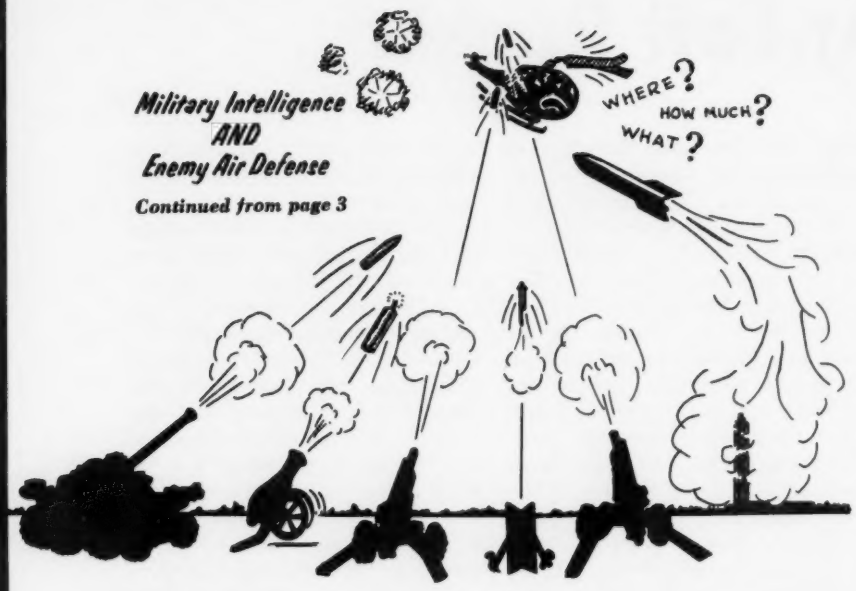
In November, Phase II of the change will occur subsequent to evaluation of Phase I operations. This phase will complete a full functional integration all the way to the individual worker level. As a consequence of Phase I there have been moderate savings in personnel and equipment. More significant savings should be realized after Phase II is completed.

Evidenced by the figures is the one-step direct access of staff elements to the command group at the Aviation Center. Though change in itself may not always signify progress, it does in this instance!

Figure 2

PROPOSED ORGANIZATION (PHASE II)





Continued from page 3

the area of operations to locate possible dead space and/or gaps. Special reconnaissance/surveillance missions may be necessary to cover these areas. Depending upon the type of operation planned, the intelligence officer must be prepared to recommend selective destruction of acquisition/command and fire control radars to afford a detection-free path for penetrating aircraft.

To enhance the survivability of Army aircraft in a high enemy air defense environment, a required operational capability for aircraft survivability equipment (ASE) has been prepared by a joint working group under the chairmanship of AVSCOM. To manage the ASE program, AVSCOM has established a product manager's office. This office has accomplished a great deal in a short period of time toward identifying and developing ASE that will increase survivability of the Army fleet of aircraft.

Improvement of Army equipment to speed correlation of information and dissemination to the user includes required operational capabilities (ROCs) for a new tactical imagery interpretation facility (TIIF) and a tactical imagery processing laboratory (TIPL). The improved capabilities of the TIIF include a computer program that will recall information such as location of enemy air defense systems as well as display of weapon effective radius of employment. Real-time viewing of incoming imagery and computer assisted plotting of detected target locations also will be available.

The TIPL incorporates faster processing of imagery, a capability for color processing, and improved enlargement/reduction equipment. As is usually the case in preparation for combat, indoctrination and training are significant. The individual intelligence staff officer and the Intelligence School must recognize the increased role of military intelligence in airmobile operations to ensure that appropriate personnel obtain a thorough knowledge of the capabilities, limitations and operational doctrine of enemy aerial targeting systems.

In addition to full use of organic collection means, the intelligence officer must understand what other sources of information are available to him such as the tactical air support element comprised of G2 air duty teams and G3 air representatives located in the tactical operations center with the fire support and airspace control elements.

Army Security Agency assets also are a source of data not to be overlooked. Using information on enemy order of battle, the intelligence officer must estimate what type weapons systems will be encountered, in what qualities and their specific locations. Weather information is a valuable asset in planning operations in hostile airspace. It also is a responsibility of the intelligence officer to ensure that weather information is obtained and disseminated expeditiously.

So that this critical area of countering enemy air defense measures will not be neglected in our future planning for combat, we must ensure the continuance of a coordinated effort among Army schools, centers and other agencies and services to develop concepts, programs, training and material necessary to get our aircraft and crews through to their assigned objectives.

General Hiestand's commands include the UN Partisan Infantry Regiment in Korea and 1st Regional Assistance Command, Republic of Vietnam. Additionally, General Hiestand has served as Chief of Staff, 1st Armored Division; Assistant Division Commander, 8th Infantry Division; and Senior Advisor to the 1st Infantry Division, RVN

WHO Shot The Troubleshooter?

CW4 Frank W. Kervin

THE TROUBLESHOOTER is dead. Oh, who shot the troubleshooter? Surprising words? We think not when we view the excessive number of expensive parts turned in as "defective," "inoperative," "broken," etc.; yet when placed on a test bench or inspected correctly they are classified as serviceable. The art of "troubleshooting" seems to have been replaced by the wasteful practice of "parts-changing."

Consider one unit's answer to a high-frequency vibration on a UH-1 Huey. Its personnel tracked the tail rotor—then changed the hub and blade assemby because the "hi-freq" was still present. This action did not correct the fault so the next step was to change the 90 degree gear box, the 42 degree box and the shafting between the two items. This didn't help smooth out the vibration either. Someone (probably with a little troubleshooting tendency) finally recommended a look at the driveshafting, and lo and behold, number two section plainly showed a wallowing motion in a dynamic state (drive shaft cover removed) and a dial indicator check after shutdown revealed excessive runout.

One small inexpensive piece of shafting was replaced and the aircraft was operationally ready (OR) once more after 2 days of combined not operationally ready maintenance and not operationally ready supply time.

What! You say troubleshooting solved the problem after all? To a degree, we agree with your claim. But what happened to all those assemblies and parts that were swapped prior to finding the cause of the hi-freq? Every one was tagged "Unserviceable" and turned in to supply channels. Over $4,000 of serviceable parts with considerable time remaining went down the drain. Ironically, this same unit continually screams bloody murder about "lack of supply support" every time their OR rate falls below normal.

Consider the time wasted swapping out components; it probably amounted to enough man-hours to complete a normal periodic inspection.

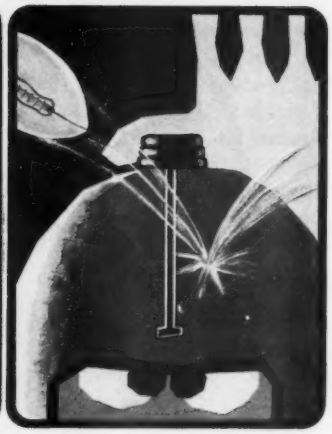
Now to get to the heart of the matter of troubleshooting versus parts-changing. It is true in this case that the "troubleshooting" chart for the Huey does not concern itself with bent driveshafting causing hi-freq vibration—*but*, the test on high frequency vibrations, TM 55-1520-210-20, page 8-5 and 8-6, points out driveshafting as the *third* item to investigate as the possible cause of a hi-freq. Commonsense should dictate it as the next item to check following tail rotor track. Why? Because tail rotor track and driveshaft inspection requires *no disassembly*.

Think about this case for a few minutes. How many other incidents come to mind where the most time-consuming operations were accomplished *first* and the simple "couple of minutes" tasks were done as sort of an afterthought when all else had failed? Webster defines troubleshooter as "*locating* and eliminating the cause of trouble in the operation of something." There is no Webster definition for parts-changing so we'll substitute his definitions for "lost" which reads, in part, "having wandered from the way, bewildered and perplexed, not spent profitably or usefully; wasted." Doesn't the foregoing definition fit parts-changing rather well?

So, let us reverse the status quo, resurrect troubleshooting as an art, a way of life, and parts-changing will cease to exist and will never need an official definition.

CW4 Kervin is chief of the General Subjects Section, Maintenance Training Division, Department of Academic Training at the U. S. Army Aviation Center

VIEWS FROM READERS



Sir:

For a book I am writing on the history of Field Artillery Liaison Aviation in World War II, I would like to hear from anyone who was a part of or has some knowledge of this operation. This includes pilots, instructors, observers, ground crewmen or anyone only indirectly connected but interested.

Jerry Eyler
271 Garden Grove Lane
El Cajon, CA 92020

Sir:

Would you please straighten me out on the following. Some personnel say that the radios in the UH-1D/H aircraft should not be turned on until the loadmeter drops below a certain level. Since there is nothing in the operator's handbook about this, or at least that I can find, I am inclined to believe that this is more opinion than fact based on some old procedure.

Please enlighten us on this—maybe we need a change in the checklist. Or do we?

CW4 Archie A Harrell
D Trp 3rd Sqdn 8th Cav
APO New York 09185

• **The U. S. Army Electronics Command, Ft. Monmouth, NJ, and the U. S. Army Aviation Systems Command, St. Louis, MO, advised that no damage occurs to radios or other components when radios are turned on in accordance with the procedures in the UH-1 Operator's Manual.**

Sir:

Frequently inquiries are made to the Reserve Components Liaison Officer and the Adjutant General Records Holding Custodian, U. S. Army Aviation Center (USAAVNC) at Ft. Rucker, AL, for copies of *aviator original rating orders.* The most frequent requests come from commanders of Reserve Component aviation units.

Many former active Army aviators wish to join either National Guard or Army Reserve aviation units. During in-processing of these individuals, an administrative requirement of the Flight Evaluation Board is to review the flight records of the aviators: One of the more important documents is the original aviator rating order.

When separated from the Army, the individual's military personnel record (201 file) is forwarded to the U. S. Army Reserve Components Personnel and Administration Center (USARCPAC) at St. Louis, MO, where it remains until requested by the individual's new military unit. Because many individuals do not keep extra personal copies of documents such as their aviator original rating orders, it is necessary for the individual's new military unit to try to secure copies of the order from USAAVNC.

Commanders in the field cannot be expected to be knowledgeable of the

Information for USARCPAC Reference Aviation Orders

Spec Orders for yrs	Shipped by	Date Shipped	Box No. of Total Boxes	Accession No.
1964	USAAVNC	18 Jan 68	6 of 7	68-A-1333
1965	USAAVNC	18 Jul 69	2 of 4	69-A-125
1966	USAAVNC	28 Jan 70	3 of 6	70-A-1059
1967	USAAVNC	18 Mar 71	2 thru 4 of 12	71-A-1216
1968	USAAVNC	31 Jan 72	14 thru 16 of 16	72-A-671
1969	USAAVNC, Jan-Oct	1 Feb 73	9 thru 10 of 22	73-A-557
1969	AG, Nov-Dec	1 Feb 73	2 thru 7 of 22	73-A-557
1970	AG	31 Jan 74	10 thru 25 of 28	Pending

Adjutant General Records Holding policies and procedures at USAAVNC and USARCPAC. As a consequence, considerable time is lost and researching efforts are duplicated because inquiries are made with insufficient background information or the inquiry is made to the wrong records holding agency.

Information required to initiate a search to locate an aviator's original rating orders includes: Special Order number, issuing HQ and date issued. This information may be found in the individual's DA Form 66 (block 15) or DA Form 66B (block 45). Without accurate information, the Records Custodian must extensively research his files to locate the desired orders.

The USAAVNC Records Holding area retains these Special Orders for 3 full years after the cutoff date, which is always 31 December of the year in which the order was published. Example: SO #100, HQ, USAAVNS, dated 21 September 1968. This SO remained in the active functional files in USAAVNC AG Academic Records until 31 December 1968. It was then transferred to USAAVNC AG Records Holding area for 3 full years. This SO, along with all other 1968 Special Orders, was shipped to the National Personnel Records Center (NPRC) (Military Records Section) on 31 January 1972. These records were then retired indefinitely in the NPRC Records Holding area.

To obtain copies of aviator original rating orders issued by the Adjutant General, USAAVNC, subsequent to 1 January 1971, address inquiries to:

Commanding General
U. S. Army Aviation Center
ATTN: ATZQ-PA-AGA
Fort Rucker, AL 36360

To obtain copies of aviator original rating orders issued prior to 1 January 1971, address inquiries to:

Commander
U. S. Army Reserve Components Personnel and Administration Center
ATTN: AGUZ-ED-SS
9700 Page Boulevard
St. Louis, MO 63132

To expedite the location of desired Special Orders requested of USARCPAC, aviation commanders should submit information shown on the chart for the year the order was issued. Complete shipping records are maintained for each year to include: date of shipment, shipment number, bill of lading number, number of containers shipped and contents within each container.

I believe this information will be welcomed by the thousands of aviators and numerous aviation commanders who will in the future want to obtain the original aviator rating orders.

LTC Richard W. Lewis
Reserve Component Liaison Officer
U. S. Army Aviation Center
Ft. Rucker, AL 36360

Sir:

In order to share my suggestion with the rest of the aviators in the Army, I felt AVIATION DIGEST might be interested in my suggestion for a *combat aviator's device.*

This suggestion has been submitted twice, and 4 years ago received very high compliments up to the last evaluator (a colonel who was probably nonrated). This time after waiting 2 years (the required waiting period) I have resubmitted the suggestion in a different manner. It has been bounced around for a year and from last report on its final route toward possible approval.

I just felt that you would like to possibly review this suggestion.

CPT David M. Watters
19th Replacement Detachment
Ft. Bragg, NC 28307

SUGGESTION

The current awarding of a device for experience and valor against an armed force is unjustly leaving out a number of individuals. These individuals on a daily basis have had more contact with the enemy, been under fire more and have been directly involved with combat operations more than any other soldier. I am speaking of the Vietnam veteran aviator and his crew. I feel that some device should distinguish this individual as a combat experienced aviator or aircrewman. I am, therefore, submitting my recommendation for a combat aviator's device and a combat aircrewman's device. The awarding of these two awards could be done by the number of combat assault hours flown as aircraft commander or CA time logged as an aircrewman (crewchief or doorgunner). I feel that there should be recognition where it is due. The responsibility of an air mission commander in a Cav troop or the lead on an airmobile assault is one that warrants reward equal to the CIB and CMB. This award would be awarded to warrant officers as well as commissioned and all enlisted. The antiquated idea that only the infantry soldier should be distinguished has long been thrown out the window, with the evolution of the helicopter. If leadership is a question, then just talk to any team lead, aircraft commander, or air mission commander. It is my hope that through this award a put aside hero of Vietnam be brought to light, THE U. S. ARMY AVIATOR.

INSTRUMENT CORNER

Q. AR 95-1, paragraph 4-26, states that for approach minimums, helicopter pilots are authorized to reduce all published visibility or RVR by as much as 50 percent, but never less than ¼ mile or RVR 1,600 feet. This reduction seems logical for nonprecision approaches, since the missed approach point is at the runway or airport, and a helicopter may be in a position to land and a fixed-wing may not. However, on precision approaches all aircraft execute the missed approach at the same point. Why is there a difference in visibility requirements for fixed wing and helicopters when executing precision approaches?

A. The decision to allow helicopters a 50 percent visibility reduction for procedures other than "Copter Only" is based on operational capabilities. Primarily, these capabilities are reduced approach speeds and cockpit visibility which allow the pilot more time to react, at the DH or MDA, to the visual cues available. The 50 percent reduction rule eases the restriction to operations during reduced weather conditions and provides an increased alternate airport selection basis which helps offset the limited range of the helicopter.

"For Fools and

COL McCullar, a dual rated senior Army aviator, is a logistician and served as assistant chief and executive officer, Procurement Division, Office of the Deputy Chief of Staff for Logistics, Washington, DC, for 4 years. He has also served as director of the Department of Maintenance Training, Army Aviation Center, Ft. Rucker; aviation officer, Eighth U. S. Army; commander, 165th Aviation Group, and deputy brigade commander, 1st Aviation Brigade, Republic of Vietnam. During the Vietnam assignments, he was head of the USARV aviation safety inspection teams. COL McCullar has been the Department of the Army aviation safety officer and commander of the U. S. Army Agency for Aviation Safety at Ft. Rucker for the past 2½ years. He retired 31 August after more than 33 years of service.

Colonel F. Max McCullar
Commander
United States Army Agency for Aviation Safety

USAAAVS

Second Lieutenants"

YEARS AGO AT Fort Myer, VA, while I was company commander, two of our soldiers got into a little difference of opinion one night in the barracks, and in the end one punched the other one in the nose and knocked him head over heels down a stairway. The first sergeant and I got them to shake hands, had them patched up, got them back to duty and promptly forgot about it. About a week later the post safety officer came by and asked, "Where's your report of the accident?" "What accident?" I asked. He said, "Well, one of your soldiers knocked another one down the stairs." And I said, "That was no accident. He meant to do it."

In looking at some of our so-called aircraft accidents I wonder how many of them truly meet the definition of an accident. In some of them it would appear that the pilot meant to do it, almost as if he had planned it.

I'm often asked to give my views on the subject of aviation safety, or accident prevention, as we prefer to call it, and I'm always willing to do this. I like to employ a technique I picked up from Chaplain (Colonel) Owen Shirey, the former post chaplain at Fort Rucker, AL. He now is retired. Thinking of Chaplain Shirey and his techniques for getting an idea across reminds me that he is one of the greatest bass fishermen in the state of Alabama if not the southeast United States. The other day he paid me one of his frequent visits and quite naturally he told me a fish story.

One day this bass fisherman was out in his boat at his favorite lake fishing his favorite deep hole, and during the process the gold wedding band he had worn for so many years slipped off his finger, went overboard, twinkled in the water and disappeared. Two weeks later this same fisherman fishing the same lake over the same hole landed a tremendous bass, a real keeper. He took the bass home and laid it on the kitchen counter. He inserted his filleting knife in that special place the Lord made for cleaning fish and sliced him open. Along about the gills he felt his knife strike something. He knew immediately what it was. It was his thumb.

Back to my views on safety and Chaplain Shirey's techniques. He always said if you want someone to understand what you're trying to say, first tell him everything it isn't. Now on safety I want to tell you everything it isn't. This will help clear your mind of these things and we can concentrate on the things I think safety is. Safety isn't a monthly safety meeting, although it has a part in the overall program. Safety isn't a yellow line painted on a ramp or hangar floor or a fire extinguisher hanging in a corner. But these also play a part. Safety isn't a magazine article or poster, but they have their influence.

I could go on and on but I think this gives you an idea of what safety isn't. So what is safety? It can be summed up in one word. That one word is discipline. Early in our military careers we learned that discipline is the willing obedience to orders. In the case of aviation, those orders take many forms, such as Army regulations, TMs, dash 10s, 20s, 34s, FAA regs, unit SOPs, and so on. These are the orders that direct how we should operate our aircraft.

You may have heard it said that regulations are written for fools and second lieutenants. My idea is that regulations are written from hard experience. Someone went out, crashed his aircraft, injured or killed himself or his passengers, and then we wrote the rules.

In the early days of aviation we had our first case of fuel exhaustion—ran out of gas. Being thinking people we then came up with a rule concerning fuel management. And that rule is that the fuel will be managed and the flight will be planned and executed so the aircraft will arrive at the destination airfield with a prescribed number of minutes of fuel reserve. Now that's quite simple. If everyone followed this regulation we would never have another case of fuel exhaustion. With proper fuel management, that 20-minute fuel warning light would never come on.

But let me tell you a story. This actually happened just recently. We received a crash facts message concerning a UH-1 that had engine failure after 2 hours and 45 minutes of flight. We queried our computer to

give us the last 10 confirmed cases of fuel exhaustion in a UH-1H. The time of flight in these 10 cases varied from 18 minutes from pitch-pull to crash to 2 hours and 34 minutes total flight time. I then told the unit their suspicions of engine failure might very well prove to be correct but I suspected fuel exhaustion. This later proved to be the case. I then informed the unit that they had set a new fuel exhaustion record of 2 hours and 45 minutes.

Back in the dark ages, a fastener came loose, a bolt slipped out or a nut worked its way off and we, again being thoughtful people, came up with a set of rules. The rules are that every fastening device will be safetied somehow with a piece of wire or lock washer or double nut or self-locking device, and then this thing will never happen again.

Yet, what has happened? Not too long ago an OH-6 took off and climbed to about 200 feet. You've probably discussed over a beer what would happen if the Jesus nut ever came off a helicopter. I'll tell you what happened. This one came off and the main rotor of that OH-6 left it like a frisbee, with disastrous results and two fatalities, proving again that from time to time the laws or rules of man concerning the behavior of man can be violated and gotten by with. However, the laws of gravity, the laws of physics and the laws of aerodynamics will be obeyed or end in disaster.

We have rules of flying covering just about every conceivable situation. However, we can't write a rule to cover every possible situation. Let me cite you another case. Two pilots aboard an OH-58, having nothing better to do, were flying over the countryside when they spied a coyote and began chasing it across the prairie. Eventually they were able to put the main rotor blade through that coyote. This feat, as you will recognize, exhibits very skillful flying. It killed the coyote and was also disastrous to the helicopter. It tore it all to pieces. Luckily, no one was injured. I don't know that we ever wrote a rule saying don't chop coyotes in two with your main rotor blades. This is a little bit beyond comprehension. Sooner or later common sense has to apply.

We, as well as the other services, long ago gave up the idea of citing a primary cause for each accident. Our accidents are coded under one or more of ten possible cause factors. The cause that has always appeared in more cases than all the others is this thing called crew error. Most accident investigating boards and reviewing and approving officials believe that because a pilot is present in most aviation accidents he must have done something that he shouldn't have done or did not do something that he should have done and thereby caused the accident.

Contrast this with the fact that maintenance problems and engineering design problems seldom appear as cause factors. I believe our aircraft are pretty well designed and screwed together. If they weren't I would never set foot in another one. So let's discuss for a minute this thing called crew error and see if we can tie that in with discipline or the lack of discipline.

In more cases than not, in crew error accidents there has been a breach of discipline that is perhaps the primary, if we could name a primary, cause factor. I'm reminded of a friend of mine who went off to college to study logic, that is, cause and effect. As a requirement in this particular course of study he had to write a paper. So he took his notebook and pencil and went into the field to make his observations. He came back and wrote the paper. His conclusions were that the wind is caused by the wild waving of the trees. This is a common experience. You've seen it. When the trees begin their wild waving the wind immediately starts to move and we hear that whoooooosh sound. I can go further and say that, according to my own observations, out in western Kansas and Colorado and the plains states where there is a scarcity of trees the windmills can stir up quite a breeze.

I've often told this story to the students of our accident prevention classes at USAAAVS. Early one morning I told a class of 32 students that the wind is

Self-discipline is a voluntary compliance with directives and regulations of leaders whose requirements are established in the interests of the organization. Thus, self-discipline is a condition that exists when a man accepts organizational control over his behavior. Self-discipline then insures that each man can be relied upon to act in accordance with the needs of his unit rather than personal ones . . . FM 22-100

caused by the wild waving of the trees and did not get one indication, not one lifting of an eyebrow or the upturned corner of the mouth or any hint, that this met with disbelief. Later I called out our chief instructor and told him, "Look, we've got 32 people in there who either believe that the wind is caused by the wild waving of the trees, in which case we have a problem, or they believe that I believe that the wind is caused by the wild waving of the trees, in which case we have a worse problem."

What does this story have to do with accident prevention? Simply, that man is the cause and he is the cure for the accident, not vice versa.

Since crew or pilot error is listed in 70 percent of our accidents, this promises to be the most fertile field to plow in the business of accident prevention. What can we do about it? *We can increase the discipline of the pilot and require him to operate the aircraft in the manner in which it was intended to be operated.*

Last year I came across an article in one of the trade journals written about Petroleum Helicopter Industries. They operate out of Lafayette, Indiana, and service offshore oil drilling rigs. In this article they very proudly announced that they were second only to the Army in the number of helicopters they operated, but they operated them better than anyone else in the world. This aroused our curiosity to the point that we contacted Petroleum Helicopter Industries, arranged a meeting in Lafayette and spent some time with them.

We were impressed when we walked into their maintenance hangar. Every opening was capped, everything was in its proper place, the hangar was spotlessly clean and the workmen went about their business in a businesslike manner. It was a beautiful sight to see. In talking with the operations personnel we learned that Petroleum Helicopter was very selective in their choice of pilots. Most of them were former Army helicopter pilots with considerable experience.

The operations people went on to say that after hiring a pilot they then sent him to the company ground school and flight school to teach him to operate the company aircraft as the company wanted its aircraft operated. And then they saw to it that he did. Somehow, over the years, we seem to have drifted away from this idea and all too often we allow the pilot to operate the Army's aircraft as the pilot thinks it should be operated.

Let me tell you a story about another civilian contractor. The operations officer had laid on three flights for this particular day, a Sunday. After he had gotten everything squared away he went to the golf course. While he was on the third or fourth tee a helicopter took off. He glanced at his watch and noted that it [illegible] on schedule and noted later that it returned [illegible]. This happened a second and a third [illegible] he continued his golf game. Then, to his surprise, a fourth helicopter took off. Knowing there was no fourth flight planned, he immediately laid down his golf clubs and got himself to the operations shack. It didn't take long for him to determine what had happened. The pilot of the fourth flight had decided to take a friend on a quote—maintenance test flight—unquote, during which they intended to go along the beaches and pick up those round glass floats the Japanese use on their fishing nets. When that pilot came back in that aircraft, the company handed him his pay and a ticket back to the states. He was no longer employed by that company.

There was probably nothing we would term unsafe in this particular flight. But the pilot did exhibit a lack of self-discipline. That is, he put the aircraft to an unauthorized use for his own purpose, and was made to suffer the consequences for his act. Luckily for him, this was dismissal rather than death or injury.

The action of the company in this particular case illustrates the application of the word discipline in its verb form, meaning to punish rather than to teach, as in its noun form. And when this form of discipline comes into play, self-discipline has somehow failed.

Commanders have told me they are unable to be present in every cockpit once the aircraft is off the ground and the pilot is on his own. But I feel that while the commander can not be physically present in every cockpit on every flight, his presence can be felt in that cockpit. His presence would be the attitude, the climate and the atmosphere that he has established through his own example, and the requirements he places on his subordinates and crews.

A large number of our Army aircraft accidents could have and will be prevented through this thing called discipline, preferably self-discipline; but in the absence of self-discipline, then applied discipline.

USAAAVS

Ted Kontos

Publications and Graphics Division
U. S. Army Agency for Aviation Safety

all about fod

FEW INDIVIDUALS have chanced upon a hibernating bear, but it's a good bet that any who have were careful not to disturb the beast. And for a good reason. Experts tell us that a bruin aroused from its winter nap doesn't look too kindly upon its uninvited guest. As a matter of fact, it becomes quite nasty—fast. And it's somewhat the same with FOD. Undisturbed, causative agents remain dormant. But prod them into action and before you know it—ZAP!—the damage is done. Since these agents are plentiful, our best protection against FOD lies in keeping them resting securely away from equipment that can stir them into action. Unfortunately, we haven't always been successful in doing this.

An FOD study shows that during CY 1967 23 percent of all T53 engine failures resulted from FOD, and that approximately half of all Army aviation gas turbine engines removed to depot showed evidence of FOD. In addition, airframe FOD caused numerous mishaps that resulted in injuries and aircraft losses. In one instance, a poncho liner blew out of the cargo compartment of an OH-6 and wrapped around the tail rotor, causing it to fail. The accident that resulted destroyed the aircraft. Another OH-6 was destroyed after a mosquito net blew out of the helicopter and became entangled in the tail rotor. A third aircraft spun during autorotation, crashed and burned after a crew chief's jacket blew out of the aircraft into the tail rotor.

During the last 6 months of CY 1969, more than 2,200 T53 engines sustained some degree of FOD. Of these, approximately 500 had to be returned to depot for overhaul at an estimated cost of $685,000.

In CY 1973, Army aircraft were involved in a total of 33 FOD-induced mishaps, for a mishap rate of 1.71 per 100,000 flying hours. Although damage costs exceeded $380,000, no injuries or destroyed aircraft resulted. At first glance, we may be tempted to accept this rate as one we must live with—that any significant improvement is virtually unlikely to be attained. This just isn't so. A check of these 33 mishaps shows that all but five could have positively been prevented. And it is likely that even some of these five might possibly have been averted.

In one instance, a mechanic broke a portion of his pliers while tightening a cannon plug on a UH-1. Al-

though he searched for the missing piece, he failed to find it. When he was called to perform maintenance on another aircraft, he neglected to report the matter and subsequently forgot about it. This bit of absent-mindedness resulted in engine damage costs of $30,-000.

Another mechanic failed to inventory his hand-tools after performing maintenance on a UH-1. When the engine was started, the pilot heard an unusual noise and shut down the engine. Needless to say, the missing tool was found—inside the engine.

A third mechanic failed to properly secure a heat shield. It came loose and struck the tail rotor blades.

Similarly, failure to properly close and secure the right ammunition bay door of an AH-1G allowed boxes of ammunition to exit the aircraft and strike the tail rotor, separating the rotor and gearbox from the aircraft. A major accident resulted. Damage costs exceeded $180,000.

Nor is FOD limited to engines and aircraft structures. It often involves individual aircraft systems or components. For example, a U-8F pilot smelled smoke after he retracted the gear following takeoff. Almost simultaneously the electrical system failed. Inspection revealed that various hardware items, including pieces of sheet metal and safety wire, left in the vicinity of the voltage regulator had caused an electrical short. Another U-8 pilot was unable to reduce power below 25 inches Hg on the No. 2 engine. The throttle mechanism was found jammed by a piece of exhaust gasket in the cowling.

Past experience clearly shows that FOD-induced mishaps rise sharply in number and severity during periods of armed conflict when both maintenance and missions must be conducted under much less than ideal conditions. These mishaps not only needlessly kill and injure crews and passengers, and destroy or damage equipment, but they do so at a time when we can least afford these losses. To ensure safety from this cause requires the incorporation of effective FOD prevention measures in our aviation safety program now—when we are not involved in any emergency. To do this, all we need is information; and the information we need is readily available.

FACTS. Although many of us tend to associate FOD with engines, mishaps resulting from airframe FOD are far more prevalent, occurring more than twice as often as those caused by engine FOD. And they generally pose a greater threat to safety because failures usually occur without warning and, in most instances, affect aircraft controllability.

While geographic location and topography play a role in FOD, few mishaps result from environmental cause factors. Most are directly related to personnel, particularly ground and air crews. Following are some of the most common deficiencies:

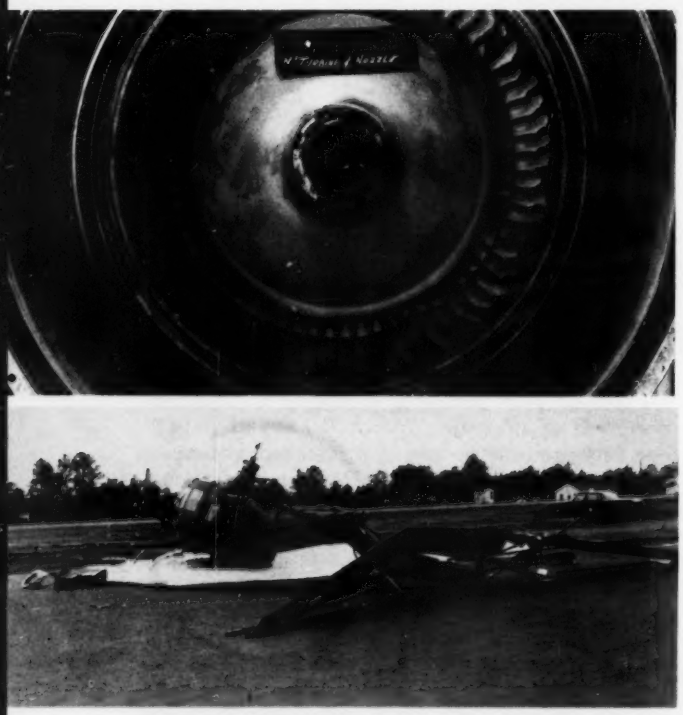
- Failure to clean engine inlet areas following maintenance.
- Failure to police litter in hover and landing pad areas.
- Depositing foreign objects on deck walkways during maintenance. (These objects—bits of safety wire, small hardware, pebbles, etc.— are usually carried by muddy shoes.)
- Allowing excess grease to remain in areas forward of the engine intake, such as in and around the short shaft of a UH-1, which will permit grease to be ingested into the engine, restricting air flow and resulting in high operating temperatures.
- Failure to ensure all inlet area ducting and screens have no loose fasteners that can work out and be ingested by engine.
- Failure to perform proper preflight of aircraft and ensure cowling is secure.
- Failure to ensure engine inlet areas are free from grass, weeds, leaves or other foliage, especially after aircraft have been operated in an environment conducive to this type of problem.
- Unnecessary hovering in areas of sand and loose foliage.
- Failure to ensure marker panels are securely anchored.
- Storing wooden blocks and other items, including personal gear, unsecured in baggage or radio compartments of aircraft.
- Storing items in areas not intended to be used for storage, such as under pilots' seats.
- Failure to thoroughly brief passengers concerning FOD hazards associated with operating aircraft.

Improper or inadequate actions of personnel have resulted in engine failures, tail rotor and gearbox separations, damaged main rotor blades, jammed engine and aircraft controls, and failure of individual systems. Common foreign objects involved in FOD mishaps include sand, gravel, loose coins, handkerchiefs, military insignia, straw, grass, leaves, nuts, bolts and other small hardware, flashlights and batteries, safety wire, a variety of handtools, bottles, smoke grenades, ammunition boxes, radio antennas, marker panels, mosquito netting, poncho liners and other personal equipment, dirt and scraps of metal.

Although some FOD may be inevitable, we can often prevent mishaps when it does occur. Consider, for example, the three UH-1s that were operated in and out of a newly mowed hayfield. All three had engines to fail. One engine failed while the aircraft was at a hover; another, during flight, necessitating an

autorotation; and the third, after the aircraft returned to its home base. All three engine failures could have been prevented by frequent inspection of the engine inlet area for an accumulation of hay. Even though this was not done, the mishaps could have still been prevented had the pilots carefully monitored the engine instruments. An unusual rise in egt or a decrease in torque with a constant N1 setting would have served as a warning of impending engine failure.

When FOD occurs, especially engine FOD, it is important that the object causing the damage be identified. A cure can then be developed and mishaps from this cause prevented. This is particularly true



Damage to compressor rotor by cotter pin or wire caused compressor stall, high egt, the burned turbine blades shown in photo, engine failure and this $28,000 accident

when aircraft of new design are involved, as aircraft configuration has been found to have a direct bearing on the type of FOD to which an engine is most susceptible. It is equally important to understand the effects of various FOD agents. For example, FOD in small turbojet or turboshaft engines is compounded by high rotational speeds generally associated with these engines. Further, tough objects of pliable construction often cause more damage to compressor blading than do hard brittle ones because they tend to block clearance ways and cause extensive distortion and bending. Ingestion of small articles of hardware can result in aft stage compressor damage and power loss. Damage to the front compressor stages has a great effect on stall margin, while damage to the aft stages principally affects engine performance. In fact, if damage is primarily confined to the aft stages, a reduction of as much as 12 percent or more in power can occur, with little or no reduction in stall margin.

To prevent engine overtemp damage during compressor stalls requires immediate pilot interpretation and positive corrective action. Misinterpretation of stall indications, particularly if they are accompanied by excessive use of throttle in emergency modes, will more than likely result in severe overtemperatures of turbine components. During flight, certain types of engine FOD, such as bird ingestion that can damage the forward compressor stages, may be indicated by higher than normal turbine inlet temperature, a noticeable loss of torque at a given speed condition and a reduction in engine stall margin. Unfortunately, engines sustaining damage to the aft compressor stages may function with normal indications until they suddenly fail.

Another type of FOD that should not be overlooked concerns contaminants, particularly those associated with fuel, oil and hydraulic systems. While we usually do not consider contamination an FOD problem, it is in reality nothing more than foreign objects within a system. These substances can readily cause hydraulic systems, transmissions, gearboxes and engines to fail, and often result in mishaps. The principal difference between this and other types of FOD lies in the size of the foreign objects in question. If they are minute, we refer to them as contaminants. If they are large, we call them foreign objects.

A classic example of fuel system FOD concerns a mechanic who used a candy wrapper to plug an open fuel line during maintenance, and then forgot to remove the paper plug when he reconnected the line. The engine failed. In any case, an effective FOD prevention program must also consider contamination problems. And the best medicine for all types of FOD is prevention. All it takes is for each unit to establish guidelines as part of their safety program and then ensure these guidelines are followed. They should include the following:

CURE. 1. Ensure all maintenance is performed properly—BY THE BOOK. This includes making certain excess grease is removed after components are lubricated and that adjacent areas are free from oily

deposits that can cause dirt buildup. All oil and hydraulic fluid containers should be cleaned before being opened, and all disconnected lines capped with approved materials such as plastic caps or plugs, fuel- and oil-resistant paper or aluminum foil taped in place. NOTE: Tape should not be used alone as the adhesive may dissolve and contaminate the system.

2. Make certain work areas on aircraft and deck walkways are cleared of litter, pebbles, etc., after maintenance has been completed. Should an item be dropped, make certain it is located. If the individual involved cannot find it, he should report the matter and the item accounted for before the aircraft is operated.

3. Police the ground around the aircraft after maintenance and place litter in appropriate containers. Never rely on a mechanical sweeper to do this job. While a sweeper is a useful aid in keeping ramps, including hover and landing pad areas, clean, it cannot do the job alone. Several years ago, a group of maintenance personnel proved this by following a mechancial sweeper as it made its appointed rounds, and collecting those items it missed. Their collection included safety wire in various lengths, flashlight batteries, used gaskets, military insignia, pencils and pens, coins, paper clips, rocks, broken glass, paper, cotter pins and a variety of nuts, bolts and other aircraft hardware.

4. Following maintenance, perform an inventory of tools used. Avoid relying solely on a visual inspection of the work area. Sometimes tools are difficult to spot. In one instance, a mechanic completed maintenance in the tail rotor drive shaft area of a UH-1 and then checked the area before calling the TI who inspected the completed work as well as the work area. The cover was then secured. Following operation of the aircraft, damage to the tail rotor drive shaft cover was noted and a thorough inspection revealed a screwdriver left in the compartment. The color of the screwdriver blended with that of the compartment, effectively camouflaging the tool.

5. Make certain all cargo is anchored before flight and baggage is secure in designated compartments.

6. Perform thorough preflight inspections, ensuring cleanliness of cockpit area and floor. Depending on aircraft configuration, small items such as paper clips can be blown out of the aircraft and drawn into the engine inlet.

7. When inspecting engines for possible FOD, keep in mind that different types of materials cause different kinds of damage to the various sections of an engine. Small rocks and pebbles can damage the forward compressor stages while causing little or no damage to the aft ones. On the other hand, hard brittle objects such as small nuts and bolts may inflict little damage to the front stages while causing serious damage to the aft ones.

7/16-inch open end wrench lodged in mast bearing area

8. Ensure all passengers are thoroughly briefed concerning the hazards associated with operating aircraft. Throwing items out of operating helicopters has caused numerous major accidents and incidents.

9. Avoid hovering or flying aircraft at extremely low altitudes over sandy areas or over terrain covered with loose foliage. If missions require this type of operation, closely monitor engine instruments and inspect engine inlets frequently.

10. Familiarize yourself with any special FOD hazards that may be peculiar to your geographic area. Is it a natural habitat of wild fowl? If so, locate and avoid areas where birds roost, and be especially cautious during migratory seasons.

11. Ensure marker panels are securely anchored.

Finally, should FOD occur despite all precautions, make every effort to determine the cause. This is especially important when FOD occurs on a new type of aircraft.

Despite a decrease in the number and severity of FOD-induced mishaps, FOD is still a problem. Yet, much of it can be prevented by identifying and keeping causative agents at rest where they belong—litter, in litter cans; tools, in toolboxes; baggage, securely confined in compartments designated for it. . . . In short, our best protection against a sleeping bear is to see that it remains undisturbed in its den where it belongs.

Should we ever be tempted to prod the beast, we might do well to remember that a "woke up" bear, like warmed-over coffee, can be mighty rough.

USAAAVS

tips for aviation safety officers

YOU HAVE JUST left the company commander's office. His introductory briefing was thorough and to the point. He is a busy man in this organization, with many aircraft, hundreds of personnel and a very important mission. Although you fully expected some sort of additional duty, he really floored you with the safety officer job.

Where do you begin? What does the commander expect of you in this assignment? How do you establish a safety program or check the current program for effectiveness? The commander knows you are not a graduate of the Army Aviation Safety Course. He has really put you in a tight spot. Has he? Not really, when you sit down and think about the job and how it might be accomplished. The following tips should aid anyone who feels he is in a similar tight spot.

ANALYSIS: First, determine the commander's personal philosophy about aviation safety. Staying within the guidelines of this philosophy, one of your first tasks will be to evaluate the unit and analyze its problems, including recommendations for solving what problems you may find. To perform this analysis, you will need to gather information and use some accident prevention tools.

Your first step should be to perform an aviation accident prevention survey. A survey is the same as an informal inspection of the unit's operation and facilities, as well as an examination of its policies. Your tool here is the Guide to Aviation Resources Management for Aircraft Mishap Prevention, prepared by and available from the U. S. Army Agency for Aviation Safety (USAAAVS). You should be able to answer many of the questions in this booklet in a positive manner. However, you will be unable to answer some of the questions. List the unanswered questions as potential problem areas, then gather the unit inspection records in all fields—maintenance inspection records, Command Maintenance Management Inspection (CMMI) records and Inspector General (IG) records. Each contains indicators of past problem areas.

By listing these areas and adding them to the results of your survey, you come up with still more problem areas that must be resolved. History records will reveal some of the past problems of the unit, particularly accident experience.

Then look at the unit mission accomplishment record. Has the unit consistently accomplished its mission without difficulty, or has it at times been unable to perform the full mission due to lack of aircraft or damaged aircraft?

Evaluate unit discipline. Discipline includes the flying habits of the aviators. Are they professional at all times? Are the enlisted men well motivated? Does the unit have problems with morale? All of these have an adverse effect on safety attitudes. When you have completed your analysis of unit problems, your next task is to determine how best to attack the problems.

EDUCATION: One of the first problem areas you will likely encounter is in the unit education program. The people involved in this program must be knowledgeable in several areas if the program is to be effective. Your first step is to build a positive attitude toward aviation mishap prevention throughout the unit. You can do this through monthly aviators' meetings and through personal contact with other aviators, the commander, instructor pilots and enlisted personnel. You must instill in these individuals a pride in workmanship. This can be achieved by various incentive awards—letters of appreciation, simple praise and an occasional pat on the back for work well done.

You must continue to communicate. With whom? You must be free to talk to the maintenance officer, the operations officer, the commander and enlisted men throughout the unit. You must move outside the unit and talk with the safety officers of adjacent units,

You must build positive attitudes toward accident prevention through the unit

The aviation safety officer is the commander's right arm in matters pertaining to accident prevention. The strength or weakness of that arm is determinded by the ASO's performance

higher headquarters and subordinate units. The communications chain in accident prevention must never be permitted to break.

One of the most difficult areas in which you must communicate and educate is hazard identification. Many people walk by known hazards every day without seeing them. As the old saying goes, "You can't see the forest for the trees."

Hazards may be in the form of foreign objects in revetment areas, on airfields, in shop areas, or petroleum, oil, lubricants (POL) areas. The simple use of handtools can be extremely hazardous if proper techniques are not followed. This becomes an education problem for the aviation safety officer.

You must be prepared to give specific classes on hazard identification and elimination or control. All hazards must be eliminated or controlled if the mishap prevention program is to be effective. If a hazard cannot be eliminated, it must be controlled.

Perhaps one of your most difficult students will be the unit commander, who may not be receptive to positive controls. He may not have the right attitude toward a mishap prevention program, simply because he believes it is interfering with his ability to accomplish the mission. If you are a good salesman, you can correct this situation by pointing out that an effective prevention program improves mission performance because it conserves resources, making them available for mission accomplishment. You may also have problems between operational and maintenance personnel. Quite often they are at odds in their attempts to satisfy the commander.

BUILDING A PROGRAM: Having analyzed the current aviation mishap prevention program of the unit and embarked upon a major education program, you must now build an effective prevention program, with certain goals in mind. The program must be oriented toward mission accomplishment, not mission interference.

You must know the deficiencies of the unit. You may be concerned with such things as the 11-point program, listed in 1st Aviation Brigade Regulation

TIPS FOR ASOs

No. 385-10. The major topics of these 11 points are:

1. Individual aviator standardization.
2. Standardization of operational procedures.
3. Loading of aircraft according to flight conditions.
4. Elimination of hazards on and around airfields.
5. Improved air traffic control.
6. Performance of preflight (hover) checks.
7. Assignment of individual safety responsibilities within functional areas of each aviation organization.
8. Unit analysis of aviation accident prevention program.
9. Avoidance of downwind operations.
10. Adherence to established directives.
11. Adherence to "normal" mission parameters and avoidance of marginal operations.

By following these 11 points, most known deficiencies existing in the standard unit can be corrected. Last, but not least, you must develop professionalism among all personnel. Professional attitudes in aviators, maintenance personnel, truck drivers and all others are essential. Each man must do his job safely and effectively. If this is carried throughout the chain of command, you can ensure a hazard-free operation.

DOCUMENTATION: Merely paying lip service to a prevention program will not implement the program, nor will it guarantee that all members of the command are aware of its existence. You must put on paper what the program will be. It may be put into the unit's standing operating procedure (SOP). It may be put out in the form of a regulation, a directive, a policy letter or a training document.

Hazards that cannot be eliminated must be controlled

Whatever form the program takes, you must be certain that it is in writing and that it is well displayed for all members to see. Once published, the communications process must carry it throughout the organization and the information must be disseminated to all personnel.

SUPERVISION: The program now requires command interest. The unit commander, through the philosophy that he gave you, must ensure that his program is implemented and that it is properly supervised. A commander who is aware of mishap prevention methods and is safety conscious soon finds his entire unit with the same state of mind. The commander who thinks little of safety will find his unit feels the same way.

If the commander uses his staff properly, all staff members will be continually coordinating mishap prevention matters throughout the organization. He must use his chain of command down to the lowest individual. He should consult with the noncommissioned officers who are working throughout his organization. Once he has developed, disseminated and implemented the program and made use of his chain of command, the program should be effective.

REEVALUATION AND CORRECTION: A commander or safety officer must continually check the results of the program, not only for compliance but also for effectiveness. If it is not effective, errors exist. These errors must be identified. The program must be reevaluated and corrective action taken. Positive recommendations are the requirements.

Let's look at a near miss. Two aircraft coming close together indicate an error in air traffic control. Something is amiss. You must evaluate this situation, look closely and perhaps reroute the traffic pattern.

Precautionary landings are sound indicators of errors. They also constitute the most fertile area for investigation because they do not leave a pile of wreckage. They leave an undamaged aircraft. Yet, something went wrong.

Forced landings are excellent investigative tools. When we move to the next higher categories—the incident, the minor accident, the major accident and the catastrophe—we are now dealing with major classifications of errors. Here, aviation safety officers can be extremely valuable in assisting aircraft accident investigation boards or officers. It is a commander's responsibility to know the real reasons for an aircraft mishap and do all in his power to correct the situation. In the event he cannot accomplish all required action at his level, he should have an ironclad case to present to higher headquarters to obtain help in solving the problem.

Commanders may delegate authority to ASOs to investigate any area which may create hazards to flight. However, responsibility for conservation of lives, materiel and combat capability remains a function of command. Commanders must fully accept this responsibility if their organizations are to successfully accomplish their missions. Helping their ASOs do their thing can be a giant step in this direction.

USAAAVS

Major William G. Daly Jr.
Directorate for Aircraft Accident Analysis and Investigation
U. S. Army Agency for Aviation Safety

part time or full time?

ONE MORNING while flying instrument refresher training with a student, we decided to land at Boondocks AAF for coffee. After coffee, I asked the operations sergeant where I might find the aviation safety officer (ASO). I was told that LT Juniorman was the ASO and I could probably find him at the maintenance hangar.

I located him in the supply office. After introductions, I explained that I would like to discuss his safety program with him. I found that, in addition to being the ASO and supply officer, he was the officer in charge (OIC) of the Alert and Service Section. He told me that he had been out of flight school about 4 months. When he arrived at the airfield he was assigned as the supply officer and OIC of Alert and Service. About a month after his arrival, the ASO was transferred and he inherited that job. He explained that his other duties kept him quite busy and he didn't have much time left over to spend on safety. He said they had been lucky and had not had an accident in the past 8 months, so there really wasn't much to do in safety anyway. He said they didn't have regular safety meetings, but sometimes the aviators got together for informal classes on regulations and such. I thanked him for his time, and we left to check the weather for our return flight.

I pondered for some time about my discussion with LT Juniorman. I thought about a friend of mine who was the ASO where I had been assigned previously. Bob Dedicated was a captain with 7 years service, 6 of them as an aviator. He was dual rated and had logged approximately 2,000 hours. He had just returned from Vietnam when he was assigned to Strac AAF.

When Bob reported in, the company commander asked him if he would be interested in the ASO job. The present safety officer was due to get out in about 3 months and the commander wanted to start working in a replacement as soon as possible. Bob said he would like a couple of days to think it over.

He discussed the job with the safety officer and decided he would take it. After working with the old ASO for about a month, he attended the 2-week Aviation Accident Prevention Course given by the U. S. Army Agency for Aviation Safety at Ft. Rucker. After his return, the commander told him he would be going to the next Aviation Safety Officers Course at the University of Southern California.

After Bob became the ASO, he managed to keep busy. In addition to his ASO duties at the field, he was a member of the post safety council which met once a month. One of the first things he established was a training program for the crash rescue personnel. He also initiated safety classes for the people in the maintenance section. From time to time he went along on training flights to evaluate the safety aspects of the training and transition programs. Bob also worked closely with the standardization section when a new training program was being developed. Mainly through his efforts, the monthly aviation safety meetings were successful.

If you were looking for Bob, you seldom found him at his desk, which incidentally, was in the operations office. Usually, Bob could be found roaming the airfield, checking refueling operations, or inspecting the maintenance area. You might find him in the control tower monitoring those operations.

One day I asked Bob about playing a round of golf that afternoon. He said he would like to, but the ASO from the nearby Air Force base was coming over to see him. I told him I didn't see where he could help much with our safety program since we flew different aircraft and had different missions than they did. Bob explained that while this was true, the basic principles of safety applied to all operations.

Another time, Bob, my wife and I were talking at a party when we were joined by his wife, Ann. She mentioned to Bob that she had been talking with another aviator's wife who was quite upset that her husband had been TDY a lot lately. I thought that this was a little too much when the ASO had his wife working for him. When I mentioned it to Bob, he said a good safety program was one that worked 24 hours a day with everyone contributing to it.

The decision rests with YOU, THE COMMANDER, and YOU, THE AVIATOR. Will YOU accept a part-time safety program, or are YOU going to demand one that is full time? What have YOU done lately to contribute to the safety program?

SAFE AND ORDERLY FLIGHT

ASK A NUMBER of Army aviators what should be done to ensure a safe and orderly flight and you'll get many different answers. Some will say "plan your flight—fly your plan." Others will tell you good preflight, good maintenance or crew coordination. But I'll bet not one will answer that briefing passengers and crewmembers on items affecting safety or mission completion is one of the best ways to ensure an orderly flight.

AR 95-1 states that the aviator in command is responsible for the adherence of passengers to regulations governing conduct in and around the aircraft. It also gives the minimum standards each aviator must observe to ensure safe and orderly flight and mission accomplishment.

Almost all of us have participated in familiarization classes prior to unit movements, either combat assaults or tactical training. Such things as making sure weapons are unloaded and radio antennae are tied down on tactical vehicles are covered.

But the requirement still exists for passenger briefings. The responsibility is just as great for safe and orderly flight from airfield to airfield as it is from field site to landing zone. In many instances, no crew chief or other crewmember is available for assistance.

How can a pilot meet his responsibility to his passengers and accomplish the mission under different circumstances without instituting costly and/or time-consuming procedures? Some good methods have been developed which, with modifications and tailoring, will help you.

One of the best reference guides is the Army aircraft passenger briefing (figure 1) contained in the USAAAVS booklet, *Commanders' Aviation Accident Prevention Plan*. (Each unit should have a copy of this booklet which is available from USAAAVS.) The checklist can be put on cardboard, covered with acetate and placed in each aircraft for use by the crewmembers. A full explanation of the checklist is contained in appendix IX of the booklet.

Another approach to the briefing problem is to furnish operations personnel with 1-page mimeo-

ARMY AIRCRAFT PASSENGER BRIEFING

1. Flight Plan
2. Approach and Departure from Aircraft
3. Seat Location
4. Smoking
5. Emergency Entrances, Exits and Equipment
6. Emergency Signals (Alarm System)
7. Safety Belt and Shoulder Harnesses
8. Helmets
9. Overwater Flight
10. Parachutes
11. Survival Equipment
12. Fire Extinguishers
13. Clothing
14. Protective Masks
15. Weapons and Ammunition
16. Refueling
17. Security of Equipment
18. Body Position (Crash Sequence)
19. Offloading

Figure 1

USAAAVS

CW4 Richard D. Havenstrite
Directorate for Aircraft Accident Analysis and Investigation
U. S. Army Agency for Aviation Safety

graphed sheets to be distributed to passengers when they check in for a flight. Figure 2 shows one used by the Ohio ARNG. Any additional specific instructions could be given by the crew upon the passenger's arrival at the aircraft.

PASSENGER BRIEFING

1. APPROACH AND DEPARTURE FROM THE AIRCRAFT: Passengers should approach and depart the aircraft from an area visible to the pilot. Use extreme caution when under the main rotor blades and avoid the tail rotor at all times. Extended radio antennas (back pack and vehicle) must be kept well clear of the rotor system.

2. SMOKING: Smoking within 50 feet of an aircraft on the ground is prohibited. Smoking may be permitted at the discretion of the aircraft commander except under the following conditions:
a. During all ground operations.
b. Immediately before and after takeoff.
c. Immediately before and during landing.
d. At any time any occupant detects gas fumes.

3. EMERGENCY EXITS AND EQUIPMENT:
a. The passenger and crew doors are jettisonable. Emergency door release handles are located forward and above the doors.
b. A fire extinguisher and first-aid kit are located on the aft center post. Use of the fire extinguisher should be limited to well ventilated areas as it contains a toxic vapor.

4. SEAT BELTS AND SHOULDER HARNESSES: Each passenger will use a seat belt at all times. Upon departing the aircraft secure the seat belt and insure that no loose ends are left hanging outside the helicopter.

5. WEAPONS AND AMMUNITION:
a. No loaded weapons will be carried aboard aircraft.
b. Explosive devices will not be dropped from aircraft and will be properly secured.

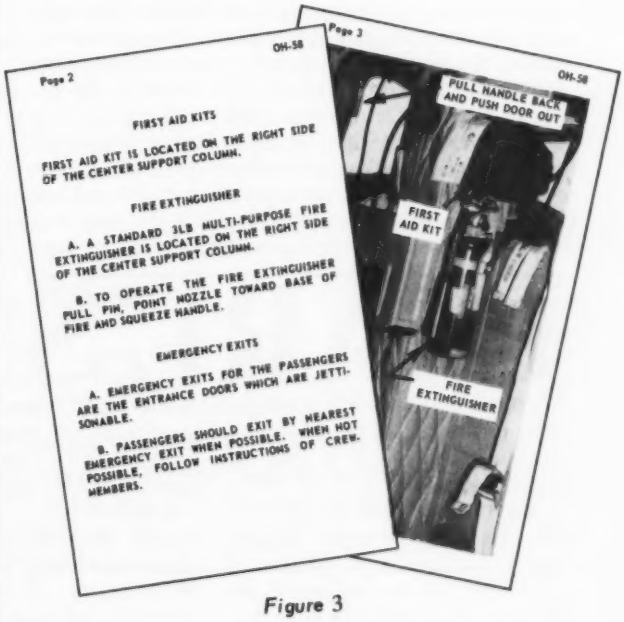
6. BODY POSITION (FOR EMERGENCY LANDING): Bend forward at the waist with feet planted firmly on the floor. The chest rests on the knees and the position is held by enfolding and locking the arms around and behind the thighs with the hands.

7. RADIO COMMUNICATION, HEATING AND VENTILATION: The pilot will brief passengers on the use of radios. Heater outlets are located on the forward door post under a circular flap. Window vents may be rotated to control fresh air ventilation.

Figure 2

Another possibility is the booklet form (figure 3). These booklets contain illustrations and instructions and, since they are designed to fit the dash 10 checklist binder in the aircraft, could be handed to the passenger as he enters the aircraft. They could be retained in the aircraft for continued use, thus reducing reproduction costs.

Regardless of the method used to brief passengers, the importance of a briefing must not be underemphasized. Regulations require it—professionalism demands it—obligations to the passengers and others promote it—let's have it.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OH-58
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Figure 3

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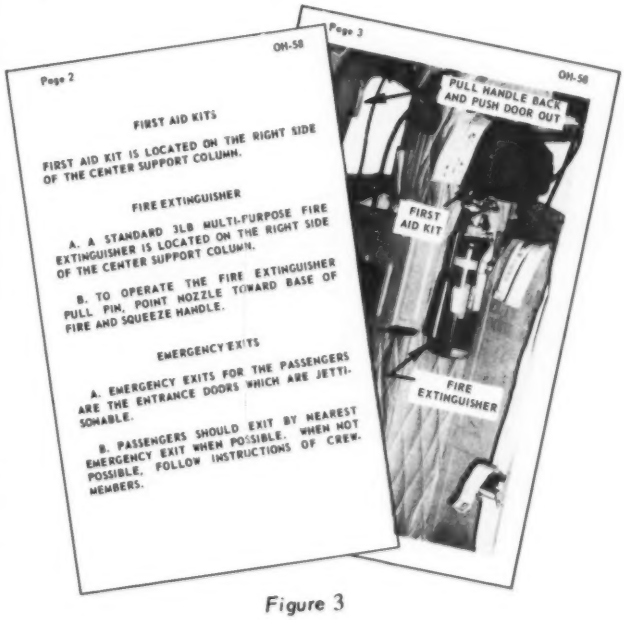
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Figure 3

SPH-4 FLIGHT HELMET

THE SPH-4 IS a good protective helmet, but it takes proper adjustment, maintenance and common sense to keep it that way. The helmet comes in two sizes—regular size, FSN 8415-144-4918, which fits head sizes up to 7¼ inches, and extra large size, FSN 8415-144-4985, which fits head sizes 7¼ inches and larger. To protect the face from flying objects and also during a crash sequence, the polycarbonate visor should be worn down during all operations. It is tough and will not shatter. Polycarbonate visors are available in clear and neutral (smoke) and should be requisitioned in accordance with TM 10-8415-206-13, dated April 1972, to replace the acrylic visors. To ensure your safety, hearing and comfort, follow the wear, care and marking procedures as outlined below.

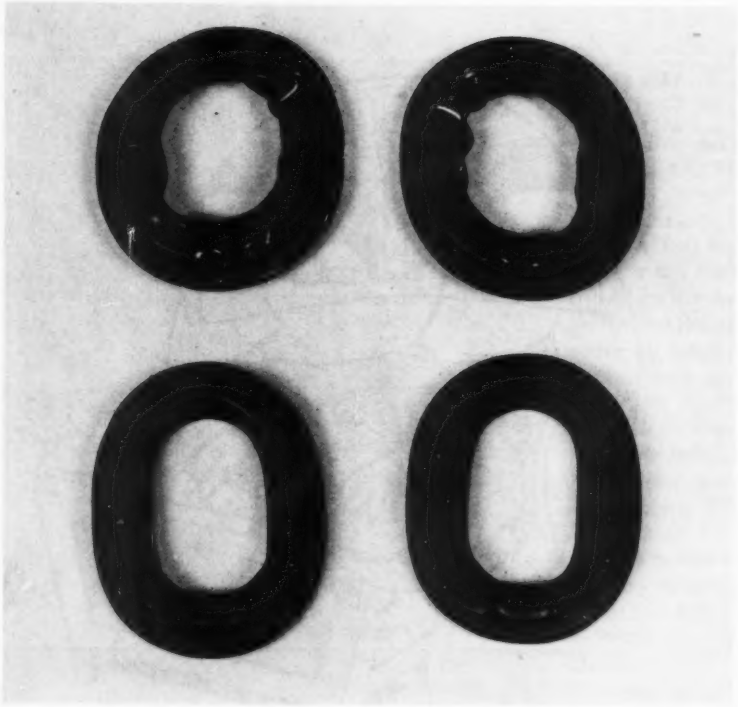
ADJUSTMENT. For optimum comfort and seal, adjust the "button" or raised portion of the vinyl ear cup (seal, plain) to fit the depression immediately

PEARL'S

Personal Equipment & Rescue/Survival Lowdown

If you have a question about personal equipment or rescue/survival gear, write Pearl, USAAAVS, Ft. Rucker, AL 36360

USAAAVS



Replace hardened and wrinkled earcups which allow unwanted noise to enter ears and are uncomfortable to the wearer

below the ear. This seal is often lost by loosening the cross-web straps located between the ear cups. However, when the helmet's sling suspension is adjusted properly and the ear cups are located in the correct vertical position, a good acoustical seal is possible without being uncomfortable.

To ensure adequate retention of the helmet if exposed to crash forces, snugly adjust the chin and nape straps and *do not use a chin pad*. A chin strap which fits loosely enough to permit slipping your finger between the strap and the chin is too loose. Always snap the chin strap in the lowest fitting. The upper snap fittings are used only when using an oxygen mask. In the event of an accident, a forward crash force rotates the helmet *upward* at the back of the head, and a loose chin strap permits more rotation and exposes more of the neck and skull. The violent rebound which follows the forward crash force causes the head to move rearward and downward, exposing the back of the head to injury. A loose nape strap also permits the helmet to rotate and move up at the back of the head in a like manner to the loose chin strap.

MAINTENANCE. Always keep your helmet dry and clean. If it needs cleaning, use warm water and soap. Rinse and wipe with a dry cloth.

Never use your helmet as a stool or for stowage. The sharp edges of a stowed clipboard can penetrate or crack the styrofoam liner which reduces its energy-absorbing capability. Therefore, make it a habit to stow the helmet in its proper place in the helmet bag. When your liner is damaged, replace it with the proper sized liner in accordance with TM 10-8415-206-13, dated April 1972.

When toting the helmet, be sure it's in a carrying bag with the mike boom pivoted inside the helmet. NEVER USE THE MIKE BOOM, THE CORD, NAPE STRAP OR A CHIN STRAP AS A HANDLE.

Keep your communications system in good working order and protect the plug and socket against mechanical damage, dirt and water.

Inspect the components frequently. Make sure the foam liner is intact and all fasteners secure. If parts appear frayed, worn or deteriorated, replace them. For example, the vinyl ear cup (seal, plain, FSN 5330-143-8577) which fits next to the skin and attaches to the ear cups was designed to be soft and flexible to facilitate an airtight seal around the ears. Unfortunately, over a period of time, the plasticizers in the vinyl evaporate and cause the pads to harden.

PEARL'S

Apparently, perspiration or body oils and some types of hair dressing react with the pads to cause plasticizer evaporation. This hardening process may occur in a period of 8 to 12 months. In any event, hardened pads must be replaced, because they allow unwanted noise to enter the ears, in addition to being uncomfortable. New ear pads should be available from either the clothing issue or personal equipment maintenance facilities at your installation. A solution to this hardening problem is in sight. Currently, tests are being conducted at the U. S. Army Aeromedical Research Laboratory, Fort Rucker, AL, to determine sound attenuation characteristics of these new pads.

Your SPH-4 will serve you well and may even save your life, so take good care of it.

MARKINGS. In accordance with TM 10-8415-206-13, dated April 1972, with change 1, dated 22 March 1973, major commanders are authorized to permit marking of helmets within their command. To properly mark the helmet, use manufacturer's code (96381) fluorescent tape, part number 3483 (orange color), which should be locally procured from Reflective Products Division, Minnesota Mining and Manufacturing Company, St. Paul, MN. Apply the tape as follows:

- Clean surface with soap and water. Rinse and dry.
- Refer to figures 1 and 2 and cut the number of pieces of tape required by the dimensions shown.
- Remove paper backing from tape and carefully apply tape smoothly and evenly to contour of helmet as shown in figures 1 and 2.
- Trim excess tape from center of visor track and housing edge.

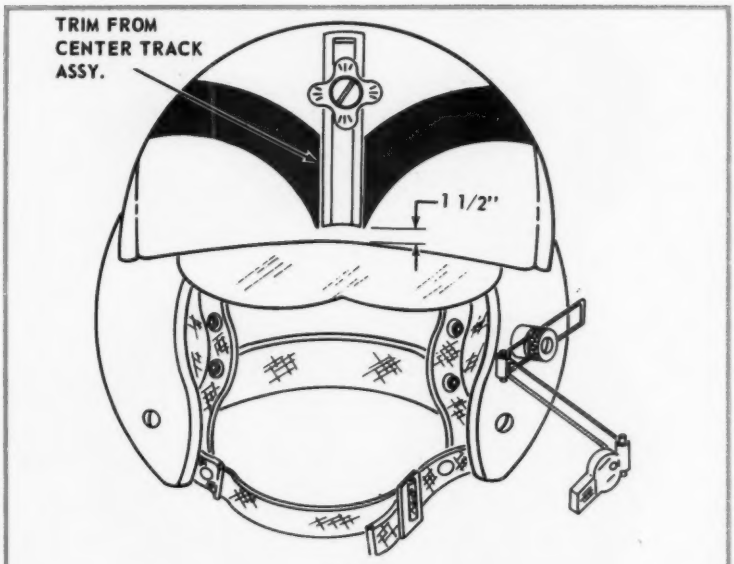


FIGURE 1

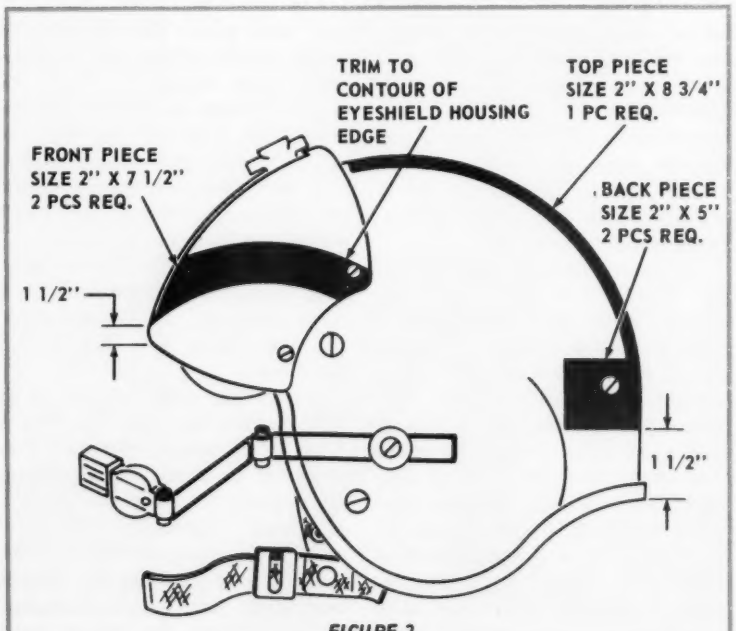
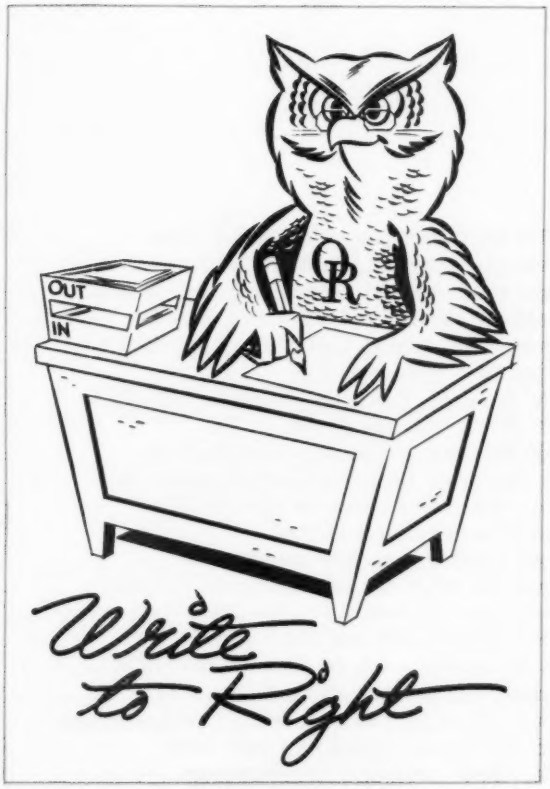


FIGURE 2



Aviation Safety Awards

I have been trying for the last 2 years to determine the correct procedure for submitting recommendations for safety awards. I have asked several aviation safety officers and none of them knew the procedure. I recall seeing a USAAVNS regulation while I was an SIP with the Department of Fixed Wing Training, Fort Stewart, GA. There are several aviators in my division who qualify for the awards but have not received them. Could you give me some information on this?—CPT

There is no central agency which serves as the Army-wide proponent for conferring individual aviator safety awards for accident-free periods of flying hours.

Each major Army commander is authorized to establish an awards program which recognizes significant achievement in accident prevention by units and individuals under his operational control. Specific information pertaining to awards programs is provided in AR 385-10, chapter 4.

Soft Caps

My unit is concerned with the potential hazard of wearing soft caps on the flight line. Aircraft rotorwash is well known for blowing the hats off personnel. The immediate reaction of the wearer is to grab for and/or chase his loose cover. Obviously, chasing a hat near aircraft with turning rotors or propellers may result in serious injuries or death. Furthermore, grabbing for a departing hat may result in a fall, especially when on helicopters such as the Cobra and Kiowa which have minimal deck space. In addition, loose hats become FOD.

This unit has established the policy that soft caps will not be worn on the flight line or on an air cavalry gunnery range. I would like your comments on this subject.—ASO

Paragraph 3-29, section IV, AR 95-1, dated October 1973, requires protective helmets (SPH-4) be worn on all flights except in multi-engine, fixed wing aircraft other than the OV-1. Additionally, Common Table of Allowances (CTA) 50-900, section II, page 85, authorizes, under line item 83491N, helmet, crash motorcyclists: tank or safety football type for individuals on jobs involving danger of head injuries from impact with hard surfaces or flying debris; that is, such occupations as ground operating personnel (noncrewmembers) engaged in rearming or refueling helicopters while engine and rotor blades are in operation, and supply or transport point personnel engaged in external helicopter lift operations.

USAAAVS recommends all aviation personnel wear a protective helmet while performing maintenance on any aircraft while the engine and/or rotors are in operation. If the above helmets do not prove adequate for your requirements, recommend you submit an Equipment Improvement Recommendation.

If you have a question concerning aviation accident prevention, write to: Commander, USAAAVS, ATTN: Orval Right, Fort Rucker, AL 36360

USAASO Sez

The U. S. Army Aeronautical Services Office discusses

MANs, not men, MANs!

MEN, HAVE YOU checked your latest MAN? For the distaff side, we're talking about Military Aviation Notice (MAN), and more than one isn't men. It's MANs, baby. IFR and VFR Supplement MANs are textual changes which indicate the page number and data being corrected. This data is printed on a slim red-bordered sheet intended for easy insertion into the respective publication. Enroute Chart, Instrument Approach/SID/STAR Procedure errors or changes of sufficient magnitude are corrected by a graphic MAN. When the period between publication of Instrument Approach Procedure Booklets in CONUS was doubled for cost savings, it became necessary to publish a bound graphic MAN. This is effective at the 28 day midperiod of each 56 day basic publication cycle. So, if the effective (cover) date of your Instrument Approach Procedure Booklet is nearly a month old, check the MAN. A blue backbone binding printed in white makes it easy to spot within the complex of bound procedures booklets on the shelf or in your ole kit bag.

You flip open the pages as they are alphabetized and see there's no new procedure for Seneca AAF and away you go. WRONG! Let's treat this MAN like any other good reference book. Open it and read the general and information instruction material on the inside front cover. The operational use of the MAN says: "Imperative . . . first consult this MAN before making any decision on which terminal approaches are current . . . in the index of the MAN. . . ." Consult the index for rapid identification of a procedure that is being changed. You may find a new procedure which will serve you better. But, most of all, check for DELETED procedures. This is the ONLY PLACE where you will find out that a procedure is no longer valid. Then look at the alternate minimums and finally the takeoff minimums and departure procedures for other changes.

You must do this for both the planning and operational phases of flight. And man, like it's extremely important if you divert during an operation for any reason. Don't ever select a destination or alternate based on the basic book weather minimums and find a MAN changed the minima to greater than the weatherman's report.

SO—USAASO SEZ—YOU GOTTA THINK *MAN*—CHECK the INDEX in your

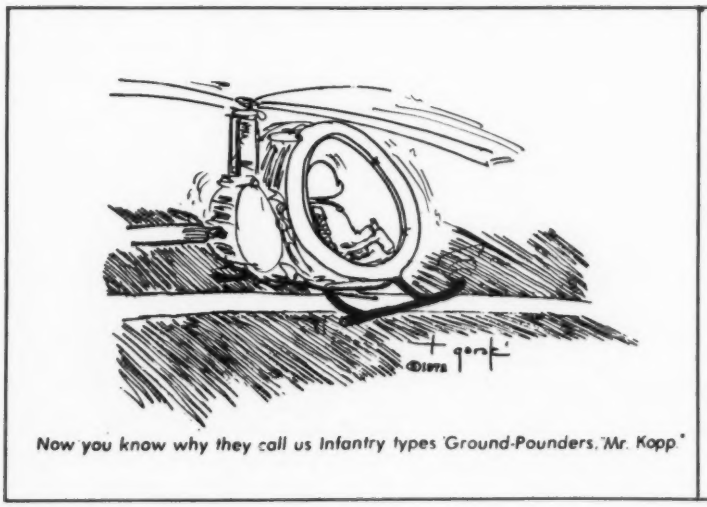
MAN

MAN

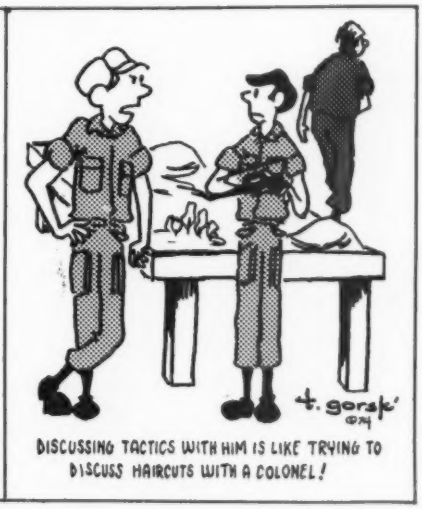
MAN

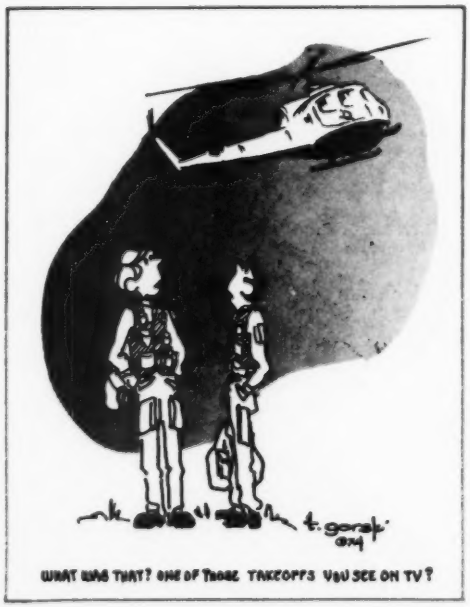
MAN

?????????



Now you know why they call us Infantry types 'Ground-Pounders,' Mr. Kopp."





THIS MONTH the DIGEST inaugurates a cartoon feature which will be appearing regularly. The cartoons will be prepared for the DIGEST by 1LT Thomas A. Gorski. We still are thinking about an appropriate title (remember Ernie Pyle's "Up Front" of World War II fame?). The name must be representative of all aspects of Army aviation . . . standardization, safety, weather, maintenance, etc. Also more than one regular character is likely to appear.

Everyone is encouraged to submit their ideas for a title. The DIGEST also welcomes group participation. The individual or group whose title may be selected will be cited in a future issue.

Please send entries individually or collectively by unit to:

Editor, U. S. ARMY AVIATION DIGEST
P. O. Drawer P
Fort Rucker, AL 36360

Or submit by AUTOVON: 558-3619/6680.

Pearl displays the SPH-4 helmet properly marked with fluorescent tape. The reflective characteristics of this tape aids in locating downed crewmembers. Step-by-step procedures for marking your helmet are carried inside, beginning on page 44.

3 USAAAVS OF 12

This is the third of 12 back covers designed to show personal survival, rescue and protective equipment. Detach each cover for a bulletin board display of the more important survival and protective equipment available to crewmembers in the field.